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Twin Punching and Shearing Machines, and Gate Machine for Shearing Plates.

The machine which we illustrate first on this page is something out of the usual line in the way of punching and shearing machinery, and is the product of the Long & Allstatter Company, Hamilton, O.

It should be stated that the punching and shearing machines constructed by the above-named firm, including a line of over 350 machines, are driven through the instrumentality of a cam shaft and clutch.

What this firm styles a double machine, consists of two single machines joined back to back, and arranged to operate entirely independently of each other, forming, in fact, two independent machines driven by a single belt and occupying about the space of one machine, two men, of course, being required to operate them.

The twin machine which we illustrate herewith consists of two single machines joined side by side, and driven by a single belt; but the movements of each machine are entirely independent of the movements of the other.

One machine may stand at rest while the other machine is working, and one machine may be working upon one class of work while the other machine is working upon another class of work; or work may be passed rapidly from one machine to the other, each machine performing upon it some different operation, or two machines may work simultaneously upon the same piece.

Thus, as shown in the illustration, one machine may be fitted with shearing tools and the other to punch, and a sheet passed through both machines may be punched and have its edge trimmed at one operation. Regardless of the manner in which the machine is operated, there can be saved the labor of one man upon any class of work which will permit one man to feed the two machines, and this labor-saving is complete even in those cases where the work is passed from one machine to another, on account of the rapidity of the movements and the saving in handling of work.

In this use of the machines it is analogous to the gang drill of the sewing machine factory as distinguished from the multiple drill of the rail mill.

The machines are constructed of any throat and capacity desired. The cut illustrates a machine with an 8-inch throat.

The tool-holding devices are the same upon each side of the machine, and will receive punch, shear, or bending tools.

The cam shaft is of hammered iron or steel, with bearing each side of cam.

The cam shaft projects beyond the front plate, where it is fitted with a hand slide, by means of which the shaft may be turned by hand in setting the tools or in bringing the tools accurately down to the work before starting the machine.

The driving gears are loose upon the cam shaft, which thus remains at rest except when the clutch is thrown into engagement by the foot lever.

Springs throw the clutches open and cause the machine to stop whenever the foot is off the treadle; but the treadles have locking hooks to permit the machines to be kept in continuous motion.

The fact should not be lost sight of that each side of the machine is independent and complete in itself, and bears no relation to its fellow except in being joined to it and receiving its motion from the same gear train.

The clutches are steel faced.

The punch holder is an open-fronted clamp, permitting ready removal of punch without disturbing the die, and it is provided with means for vertically adjusting the punch independent of the vertical adjustment of the slide.

The cam pintal, by which the cam communicates its motion to the slide, is either of steel or phosphor bronze, and is of the Whitworth type. The slide gib is of gun metal fitted the whole length of the slide jaws.

The front plate is firmly locked to the slide jaws, whereby perfect rigidity is secured for the front cam shaft bearing.

The pull-off, or stripper, is a forged lever, forked to straddle the punch, and pivoted in the throat of the machine.

It is adapted to different thickness of metal by adjusting vertically its rear end. The tight and loose pulleys make seven revolutions to each desired stroke of the slide.

When the nature of the work requires it, an automatic stop motion is attached to either or both sides of the machine, whereby, upon pressing the foot treadle, the slide makes one stroke, then rises and stops at its highest point, and so remains until the treadle is again pressed.

This machine is made in thirteen different sizes, each size having a large variety of throat depths.

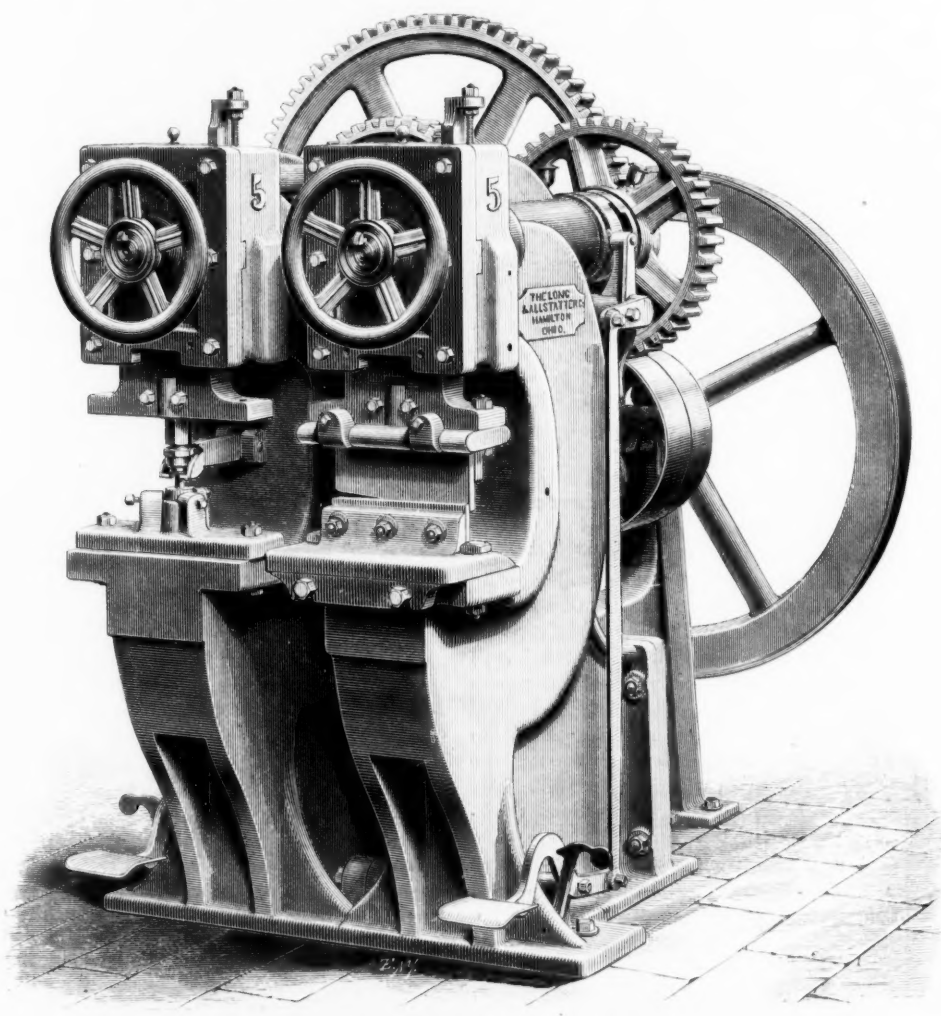
The second machine illustrated is a metal shearing machine of the gate pattern, also constructed by the Long & Allstatter Company.

Incidentally it may be mentioned that the machine illustrated is chosen from a line of over 300 machines belonging to the punching and shearing class.

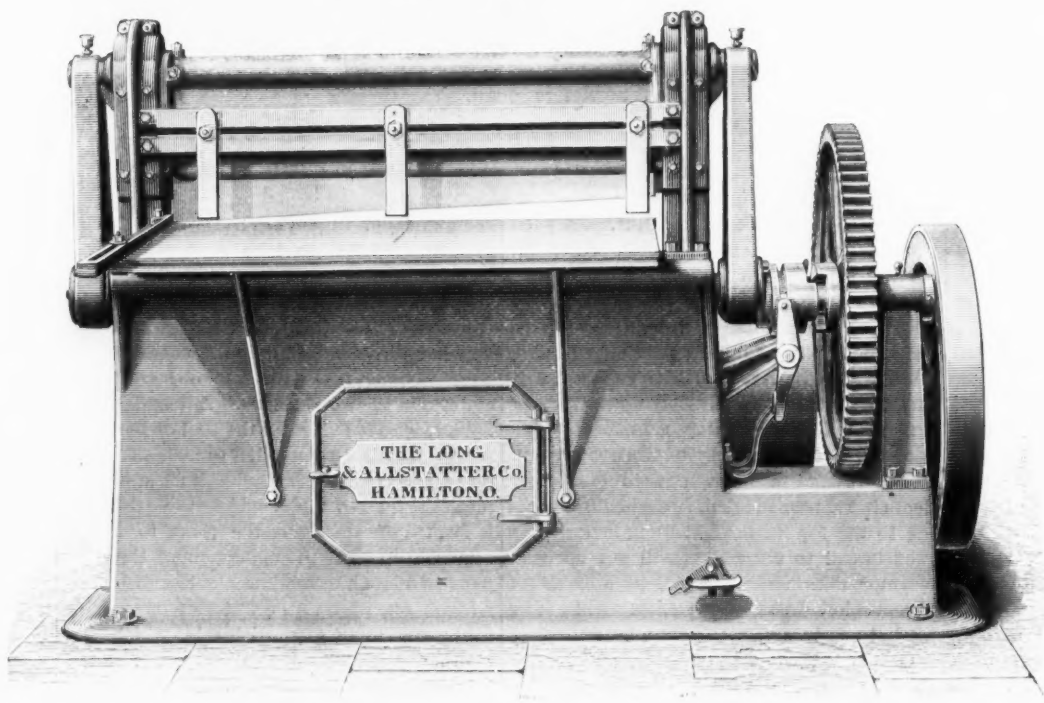
In this machine a box-like bed is provided with a flat table having suitable squaring gauges, and fitted with uprights in which slide the gate carrying the shear blade, which operates in connection with a bed blade secured to the table.

Beneath the table is journaled a shaft having an eccentric at each end of the machine, which eccentrics connect by rocking pintals to wrists upon the gate. A spur wheel having a clutch hub runs loose upon the cam shaft, and is driven by a self-contained countershaft having a fly-wheel and tight and loose pulleys, the gearing being so proportioned that the belt pulley makes seven revolutions for each desired stroke of the gate.

The cam shaft and the gate are normally at rest while the spur gear revolves continuously. A sliding clutch upon the cam shaft is held out of engagement with the spur gear by a double spring,



TWIN PUNCHING AND SHEARING MACHINE.



GATE MACHINE FOR SHEARING PLATES.

and is thrown into engagement at will by a foot treadle.

The gate thus operates so long as the foot treadle is pressed, and the treadle is provided with a locking hook for permitting the machine to run continuously regardless of the pressure of the foot.

When so desired, the machine is fitted with an automatic stop-motion by means of which, at each pressure of the foot upon the treadle, the gate makes one stroke and then automatically stops at its highest point awaiting the next pressure upon the treadle.

Suitable hold-down or stripping devices are affixed above the table to steady the sheet while being cut.

The machine illustrated will shear ¼ inch plate 40 inches wide, and weighs 3,500 pounds. The cam shaft is of hammered iron or steel, the pintals of steel or phosphor bronze, and the clutches steel-faced.

Machines of a similar type are manufactured by the same concern of a variety of sizes and capacities; in fact, to shear any width and thickness of plate.

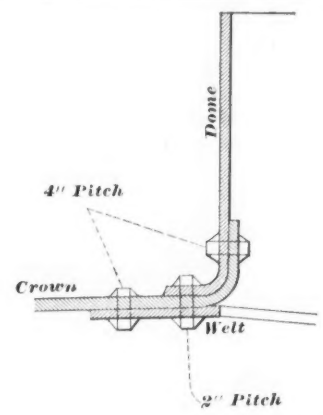
Compound Locomotives in Europe.

Compound locomotives have been in use now on European railways for upwards of ten years, and mechanical engineers have had good opportunities of comparing their performance with that of ordinary locomotives. France has been the nursing ground of that form of locomotive, and its merits were highly commended by its leading sponsors for years. This was probably what induced Mr. Webb, the locomotive superintendent of the London & North Western Railway to try the experiment of compounding locomotives. His engines have attracted much attention, and their performance has been closely watched by leading engineers in Britain. The engine does not appear to make any progress into favor. Its friends and advocates anticipated as much success for the compound locomotive as had been attained by the compound marine engine, but their hopes seem destined to disappointment. By making careful computations of the fuel used by a representative engine of this type running a well known train *Engineering*, concludes that no saving of fuel worth mentioning is made. If this is correct, the engine is a failure, for it is much more expensive for repairs than an ordinary locomotive.

Two immense dredgers that were built on the Delaware for the Panama Canal are at work and doing excellent service. Many of the construction locomotives at work at the same place were also built in American shops. The excavations are progressing very satisfactorily, there being upwards of 15,000 men employed on the different sections. Most of the common workmen are from Jamaica and Cartagena, but the skilled hands, such as carpenters, machinists and engineers, are from Europe or the United States. The health of the colony is fairly good, considering the region where they are located.

New Mason Locomotives for the Boston and Providence Railroad.

The Mason Machine Works, Taunton, Mass., are building a group of standard locomotives for the Boston and Providence Railroad Company, designed to combine speed and power in a higher degree than common. The engines are got out in first-class style. A few of the leading particulars are: Boiler material, mild steel $\frac{7}{16}$ thick; all seams double riveted, longitudinal seams strengthened by inside welts; slope sheets strengthened by stay bolts screwed through the foot of T-iron stiffeners and slope sheet on both sides, for the admission of which two rows of tubes are set a little farther apart than the regular distance. The outside crown sheet is flanged upward to receive dome, and secured as shown in cut; back and front ends secured to gusset stays and bolts to center of boiler; fire door flanged outward without projecting beyond outer surface of back sheet. The diameter of barrel is 54″, grate 78″x35″, steam pressure test 200 pounds to square inch. The cylinders are 18″x24″,



drivers 68″ diameter, with centers 9 feet apart. The crank pins, axles, and piston rods are of Krupp steel; Allen paper wheels are used on the truck; the coupling rods have solid ends with keys; engine truck swing bolster pattern; journals, 5½″x11″. The tender trucks are the regular Mason pattern, with steel rockers; tank capacity, 3,600 gallons. Two Sellers injectors are put on the right-hand side, and the air pump is placed on the left-hand side. Colby's patent draw-bar and bunter is attached to the tender. The weight on the drivers will be about 30 tons, and the truck will bear about 14 tons.

Elevator Safeguards.

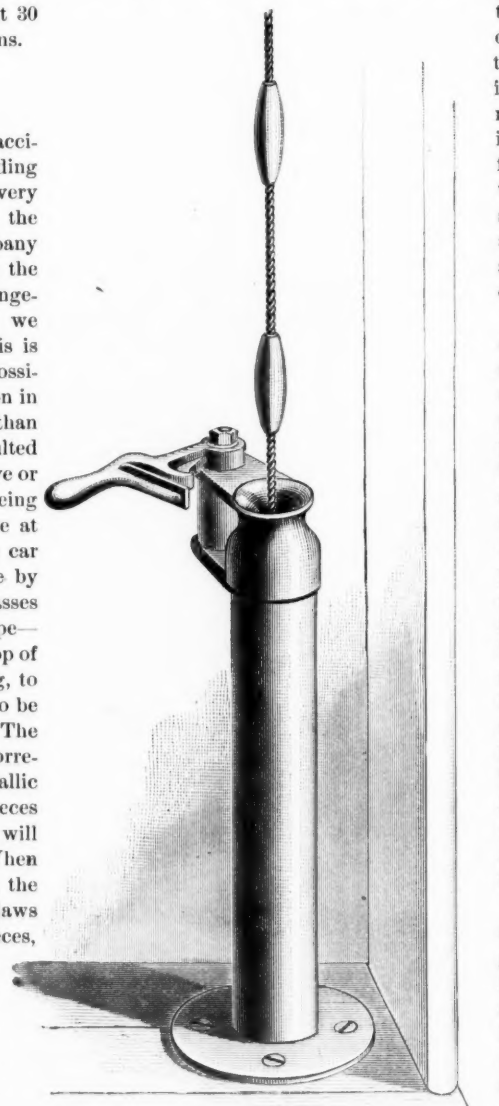
The increasing frequency of elevator accidents indicates the importance of providing safeguards against their occurrence in every way practicable. While at the works of the Brown & Sharpe Manufacturing Company recently, we noticed in connection with the elevator in their main building the arrangement shown in the engraving, which we make by permission. The object of this is to provide, when desired, against the possibility of putting the elevator car in motion in either direction from any other position than from the car. Serious accidents have resulted from some one starting the car from above or below when, for instance, something is being loaded or unloaded at a floor, and those at work are in position to be caught by the car if it moves. As will be seen, the rope by which the car is stopped or started passes through an iron tube—a piece of gas pipe—situated in the corner of the car. The top of this tube is provided with a brass casting, to which a stop with jaws is pivoted so as to be swung horizontally in either direction. The rope has attached to it at positions corresponding with the different floors two metallic pieces a short distance apart. These pieces will readily pass through the tube, but will not pass through the jaws of the stop. When it is desired to stop the car at any floor, the operator swings the stop so that the jaws come around the rope between the two pieces, when the motion of the car moves the rope, shifting the belts and bringing the car to a stop. At the same time, this locks the rope against motion in either direction sufficient to shift the belt, so that before the car can be started the stop must be moved around off the rope to the position shown in the engraving.

The machinery of this elevator is provided with back gears, which are occasionally used for a heavy lift. At such times there is a possibility that, while the gearing is being adjusted, some one may shift the belts to put the car in motion, catching the man who is making the adjustment in the gearing. To avoid the possibility of this, a hinged dog is arranged here so that by its use the possibility of this is avoided.

Another feature of safety is in the doors in the several rooms leading to the elevator well. These, instead of being opened like other doors in the rooms, are only opened by reaching to the top for the fastening, hence those accustomed to the rooms will not open an elevator door and walk off in a freak of absent-mindedness, and strangers will not be likely to find the fastening at all.

Of course, when practicable, an elevator should always, as is the case in the instance noted, be in charge of one man; but this is not always practicable, and even when it is, simple safeguards like this afford additional elements of safety. In instances where an elevator is but little used, and then by any one, of course such devices become of still greater value, affording almost the only means of safety.

There is a certain class of people among us who have always made a business of running down our native manufactures. Till all the rest of the world publicly acknowledge any line of manufacturing business to be entirely successful, these fault-finders keep repeating that we cannot make anything so cheaply or so well as it can be produced by our foreign rivals. Every branch of our manufactures has been subjected to the odium of this depreciating sentiment during its infancy, and not a few have been ruined through its influence. Lately, the enemies of our industries seem to have concentrated their forces in attacking American ship building, and the American Ship Building Company is one object of their enmity. That company was organized a year ago, and has made good progress in iron ship building. Several first-class vessels have been launched, quite a number more are on the stocks, and a large quantity of machinery has been erected to do the work



Safeguard on an Elevator.

economically. Just when the company seems getting prepared to take part with other yards in showing that American ship builders, with the aid of the most approved machinery, can compete successfully with foreigners in iron ship building, a persistent attempt is being made through our courts to embarrass their operations. A small stockholder, who is evidently the tool of the company's enemies, has applied to have the charter of the company annulled on the absurd plea that the law under which the company is formed does not give the right to manufacture ships. If the managers of the company had let ship building alone, and directed their attention to the watering of stock or to the making of any articles in which foreign manufacturers are not interested in underselling us, there would be no objection to their attending to their business without molestation.

Draft Regulating Appliances.

By J. Dugald Campbell.

THIRD PAPER.

Much aid can be obtained in deciding upon the proper shape of the nozzles by observing the action of the draft through the smoke-box door when the engine is running. This can easily be done where a long exhaust pipe is employed; and where a short pipe is in use, the observation can be made by the exercise of some trouble and patience. An important point in obtaining a good draft is to be certain that the nozzles are central with the lift pipe and stack. There can be no free steaming where the exhaust discharges itself upon the side of the stack, instead of taking the direct line to the atmosphere; yet no draft defect is more common. The importance of keeping the appliances used to promote draft induction in proper order is well demonstrated in the case of the water injector, of which the former is the prototype. In that we are quickly taught that any deviation from right proportions or position results in failure. When an injector gets worn out, or when by any means its tubes get out of their exact alignment, men do not generally attempt to force it into action by giving it more steam, for, fortunately, its disorders will not be doctored in that manner, but that is the ordinary way of treating draft appliances when they are suffering from exactly the same malady. Harmonizing the parts is seldom considered in the construction of draft and exhaust pipes, especially where the short exhaust pipe is used, and in many cases where the long pipe passes out the steam.

With low-placed nozzles, the usual plan of construction is to give an exhaust tip for each cylinder. The reason given for doing so is, that the uniting of the two exhaust pipes in a common center results in back pressure by the exhaust passing over the bridge from one cylinder to the other. The efficiency of the single exhaust nozzle, which can be placed exactly central, giving a straight line jet, is generally conceded as a promoter of induction, but its advantages are sacrificed to avoid an evil which is more imaginary than real. Where any degree of back pressure results from the use of a single nozzle, faulty construction is responsible for the defect. The use of a single nozzle admits of a much wider tip opening than where double nozzles are employed. Thus an ordinary 17x24 locomotive will have double nozzles about 3″ diameter, which gives an opening a little over seven square inches, through which all the steam from one cylinder must pass.

The same engine could steam with a single nozzle of about 5″ diameter, which gives nearly 20 square inches of opening. It is reasonable to believe that the exhaust steam could escape through the large opening with less back pressure than through the small one, and it would pay to go to the trouble of designing an arrangement of the exhaust pipes to avoid the structural defect that permits the steam to shoot from one pipe to the other. It is doubtful if even the worst cases of passing steam from one pipe to the other are so bad as they are popularly believed to be. Nozzles must be ruinously contracted to send escaping steam away at a sharp turn through long steam passages, where it will farther expand, and yet get into the cylinder in a condition to obstruct the piston. All tendency of the steam shooting over into the opposite exhaust pipe can be prevented by making the sides of the pipes nearly parallel to the direction of the column of exhaust steam for some distance before reaching the point where they come together.

The lifting pipe performs induction in two ways, by the exhaust steam passing through itself, and by its act of leading that steam into the stack. The degree of induction at each end of the lifting pipe directly affects the uniformity of combustion in the fire-box, and it can be regulated by raising or lowering the pipe, that having the effect of increasing or diminishing the induction as desired for drawing the gases uniformly through

the flues. The means of induction are necessarily less at the upper than at the lower end of the lift pipe, for the steam, in passing through, loses pressure by expansion and friction. If we again copy from the water injector, we can perceive that the lifting pipe should be tapered towards the top, so that the smaller opening will have the effect of restoring the usefulness of the exhaust steam by gathering it into a compact column before its discharge into the stack.

While the body of the lift pipe, and its position and dimensions in relation to the exhaust, are the principal means that regulate induction, it is important that the flare at the mouth of this pipe, or the opening at the bottom of the stack, shall not obstruct the inflowing currents. Retardation of the currents will be prevented by the use of an easy flare on the lift pipe, and a similar opening to the stack would be an advantage. The truth of this will be demonstrated by observing the location of the sparks in a locomotive smoke-box when the long exhaust pipe is used. It will be found that a quantity of cinders have been taken up by the exhaust, and, being unable to find entrance at the limited opening, are thrown back against the flue sheet. While it is not desirable that cinders should go up the stack, the same action that returns them throws part of the gases aside, tending to create a whirl downward that interferes with the upward current.

The Indicator Diagram.

BY F. F. HEMENWAY.

DIAGRAMS FROM TWO LOCOMOTIVES COMPARED.

The diagrams, Figs. 13 and 14, fairly represent the way steam is sometimes worked in the cylinders of two locomotives when the valve motion of each is believed to be in good condition. That in Fig. 13 was taken, at 6″ cut-off, from a passenger engine with cylinder 16″x24″, speed 338 revolutions, corresponding to a piston speed of 1,352 feet per minute, or a speed on the rail—the drivers being but 5 feet—of 60 miles per hour. The boiler pressure was 126 pounds; throttle wide open. It will, of course, be understood that this locomotive was not intended for such speed, about 45 miles per hour being the usual limit. The steam ports are 1¼″x14″, ridiculously small for such speed, notwithstanding which the diagram will be found to "work up" much better than it looks. The worst feature is the back pressure. This, up to the point of exhaust closure, which is not indicated with any clearness on the diagram, will average about 10 pounds. The mistake should not be made of considering that this represents a loss during the entire return stroke of 10 pounds pressure, because it cannot be accounted as back pressure after exhaust closure, as then the steam in the cylinder is saved for further useful work in the next stroke, thus neutralizing part of the loss. How much of this loss from back pressure is due to small ports, and how much to small exhaust nozzle, is not shown by the diagram. The nozzles, 2½″ diameter, were afterward changed, those of 2⅞″ being substituted, which very materially reduced the back pressure at slower speeds; but, unfortunately, prejudice brought about a change back to the smaller ones before an opportunity was had to try the effect at the higher speed.

The compression, with the lead, brings the pressure well up to that in the boiler, but probably not quite so high as represented by the diagram. If compression, as will be admitted, reduces the amount of useful work done, as shown by this end of the diagram, in one way, in another way it increases it, and incidentally increases and tends to equalize it throughout the stroke, as without liberal compression it would require ports of enormous proportions to so nearly permit boiler pressure being realized in the cylinder at the beginning of the stroke. After the piston begins to move forward the pressure falls off rapidly, just as it would with any valve gear at this speed, and so small ports. In this diagram, as in the instance of the one shown last week, there is no evidence of loss from too early release.

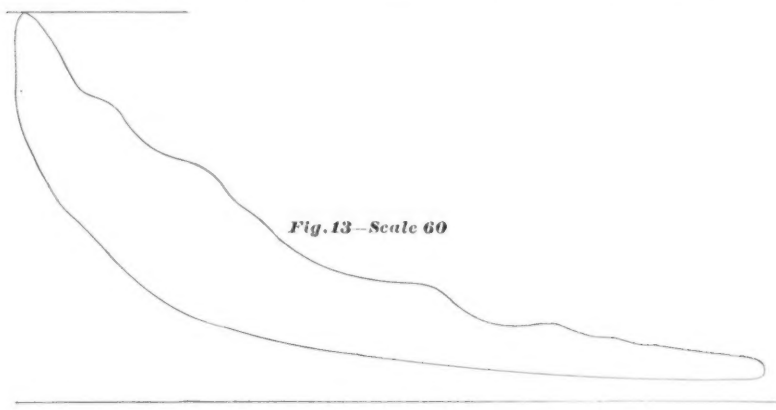


Fig. 13—Scale 60

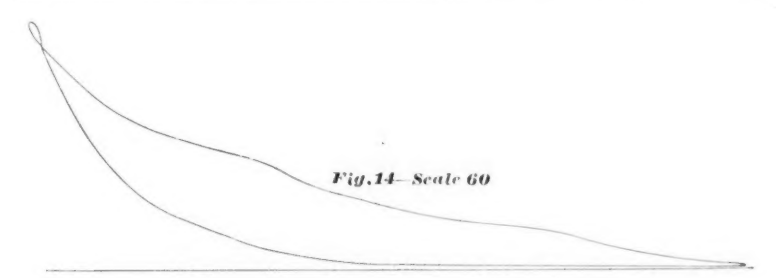


Fig. 14—Scale 60

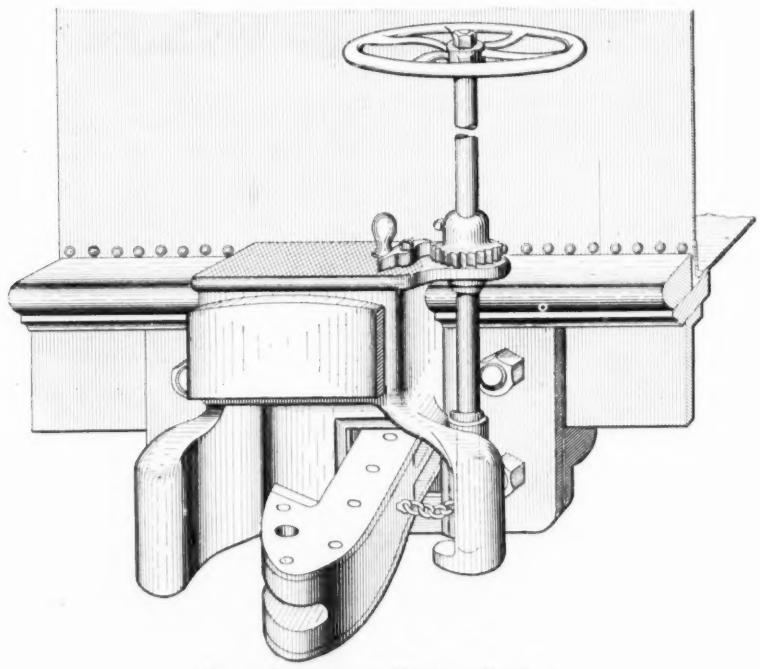
This bugbear of early release, at such speeds as a short cut-off is ordinarily employed at, is purely a theoretical one, never amounting to a loss that can be calculated at a speed of above 30 miles per hour, and even under such abnormal conditions as represented in Fig. 14, always leaving a doubt whether it is not neutralized by a reduction of back pressure.

The diagram in Fig. 14 is quite different in nearly every respect from the one shown in Fig. 13, and is worth some consideration. It is from a "Mogul" locomotive, cylinders 18″x24″, with ports 1¼″x14″, taken at a speed of 85 revolutions—340 feet piston speed—cutting off at 6¾″, boiler pressure 122 lbs., full throttle. At this piston speed it is a matter of some surprise that the mean effective pressure is only a little more than half as much as in diagram 13, at four times the speed. In this diagram (14) the compression is 80 lbs., *apparently* a little above steam-chest pressure, that is, the little loop at the termination of compression is what is frequently traced when steam is compressed higher than the pressure in the steam-chest.

This was not the case, however, in this instance. Compression was carried to a point when at the slow motion of the piston the heat was taken up by the metal of the cylinder faster than it was furnished by compression, and the pressure fell, as is frequently the case at slow piston speed, before the valve opened the steam port.

It is not necessary to look far to find why less mean effective pressure is obtained in this cylinder than in the other. In the first place, the cylinder is 25 per cent. larger, and the ports 10 per cent. smaller. The slower piston speed should, however, much more than offset any loss in this respect. Another thing that had some influence is that in the instance of the high-speed diagram the steam was reasonably dry; in the other, unreasonably wet. The wet steam, doubtless, had some effect to keep the cylinder cool, so that more of the steam that was admitted was condensed to restore the heat. But neither of these is the principal reason for the loss of effect, which is that the valve is behind at all points. Instead of the lead taking effect early enough to join the admission and compression lines, and carry the pressure up to that in the boiler, the valve does not begin to open till the beginning, or a little later than the beginning, of the stroke, and then the amount of the opening is insufficient to keep up the supply, to say nothing of increasing the pressure. A good feature of the diagram is the small amount of back pressure. This result is due to the exhaust lead, which reduces the pressure nearly to that of the atmosphere at the termination of the stroke and gets the exhaust well open, so that at the slow piston speed, with large exhaust nozzles, it is kept low up to exhaust closure.

The lack of lead, and the fact that the valve is generally behind is due in part to lost motion, and perhaps in part to some spring of the parts of the valve motion. The difference in this respect between the valves of the two engines is that that of the cylinder from which diagram 13 was taken, was relieved of the greater part of the pressure on its back by being balanced, while the other was not. The peculiarities of the link motion are such that to obtain good results at short cut-off the valve motion must be in good adjustment *while working*. Whether it is or is not so can only be determined with exactness by the use of the indicator.



COLBY LOCOMOTIVE TENDER COUPLER.

The horse-power developed by the engine from which diagram 13 was taken (both cylinders) was 434; that from the one from which diagram 14 was taken 78—too small an amount to be of much use in handling a heavy freight train. The dry steam exhausted per horse-power per hour was, as shown by the diagrams, 35 per cent. more in the latter case than in the former, and it is beyond reasonable doubt that the steam condensed was proportionately much greater.

Colby Locomotive Tender Coupler.

We here show in perspective a coupling attachment for locomotive tenders, invented and patented by George H. Colby, master mechanic of the Boston and Albany Railroad at Boston, Mass. The usual plan followed for coupling passenger locomotives to the train is the ordinary link brought into use in freight train service. Although inventors have been at work for half a century improving passenger coach couplers to keep the vehicles from bumping against each other while running, and their efforts had been attended with eminent success, the coupler on the tender remained practically untouched. In some instances horn castings have been attached to the tender draw-bar, which reduced the loose distance by meeting the car-bumper, but this improvement was far from being effective, and was merely better than nothing. Under certain conditions of train running this loose coupling would induce an uncomfortable vibration to the whole train, and at times the application of the brake would cause the jerking of the coaches in a disagreeable way. To remedy the many drawbacks to a loose coupling Mr. Colby invented the attachment for locomotive tenders shown in the cut. It practically couples a car to the locomotive, just as two cars are coupled together, and connects the whole of the train as an unbroken unit. Every improvement of this kind increases the safety of train operating, and tends to weaken the force of accidents, and we willingly commend the Colby coupling to the attention of railroad men.

The Colby coupler consists principally of a heavy casting, which is attached to the tender-bumper beam, and which holds the draw-bar, a spring bunter, and the means of operating the draw-bar. The forward end of the draw-bar is pinned to a heavy threaded spring-encircled bolt, secured under the tender between the frames in a strong casting. A spiral spring, secured to the draw-bar immediately behind the bumper beam, draws the head into the position it occupies when coupled. The act of uncoupling is done by a wheel and staff, which operates a chain and ratchet. The invention has all the parts well arranged.

Railroads in Nicaragua.

Mr. J. W. Metcalf, master mechanic of the railroad of Nicaragua, is in New York on a business visit. He brings the information that several new railroads are in course of construction in Nicaragua and that others are projected. The railroad with which he is connected is sixty miles long, and it does a paying business in carrying native products, such as coffee, dye-stuffs, and lumber, and also does a fair passenger business. This road, like all the others in the country, has been built by Americans for the Government, which controls and operates them. The standard gauge there is 3′ 6″; the work of construction is very similar to that of our Western roads, and the roads are operated in a similar manner. All the machinery and rolling stock used are of our manufacture. The engines are worked at a good margin within their capacity, which makes them wear well, and the policy is followed of keeping all the machinery in good repair. The men running the engines have to do a good deal of their own small repair work. As wood is cheap and coal dear there, wood is used exclusively as fuel. The skilled labor is done mostly by Americans, but the natives are working into the skilled lines of work. Peons do all the rough laboring work, and they are spoken of as industrious and peaceful.

Sectional Safety Steam Boiler.

The sectional boiler illustrated herewith is of the inclined water tube type, composed of a number of rhomboidal headers, which have expanded into one side four four-inch wrought iron lap welded tubes, the headers being connected together vertically by means of short pieces of wrought iron tubes expanded into each header, there being one plate on the inside directly opposite the four tubes, so that when the plate is removed the four tubes are exposed, with ample room for cleaning and repairing. The plates are ground metal to metal. These headers are of cast-iron, but it is claimed that they are as safe, durable and strong as wrought iron for the same purpose. They are made of a special mixture of charcoal iron, and each header or section is tested to a pressure of 300 lbs. per square inch, in a testing machine constructed for that purpose, and there has not been, we are told, a single one broken out of all that have been tested.

The special mixture of which they are composed will, it is said, stand a tensile strain of 50,000 lbs. per square inch, and the rhomboid is so braced, ribbed and carefully proportioned in the distribution of metal as to effect the desired strength and rigidity, while 8 $\frac{3}{4}$" stay bolts through each header make an additional factor of safety.

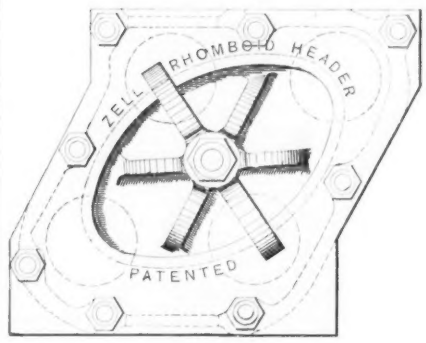
The plate is secured in position by a wrought iron bolt $1\frac{1}{4}$ inch in diameter, riveted on the inside, and passing through a cross-bar upon the outside of the header, a nut being used as on ordinary man-hole plates. By removing one plate four tubes are accessible for cleaning and inspection.

The sections are placed in vertical rows, which throw the rows of tubes into a staggered position, breaking up and utilizing the currents of flame and hot gases from the furnace, each vertical row connected by the short nipples constituting each row a boiler of itself. On the top of each of these headers is connected a header into which one tube of larger diameter is expanded. These larger tubes extend horizontally back to the steam drum, and are expanded into the drum on a line drawn through its center and above the water line. Under the bottom of the steam drum, and connected thereto by flanged steel nozzles, is a steel water drum, corresponding in size to the capacity of the boiler. This admits of a large volume of water being carried in this boiler—as much as in a return tubular boiler of equal horse-power—without necessitating the passage of steam through the mass of water. This water drum is in turn connected to the top row of the rear headers, by expanded nipples, as previously explained.

The mud drum is located below the inclined tubes, under the bottom row of rear headers, and is provided with ample means for cleaning. When erected these boilers rest upon four carriages—two back and two front—those at the back end being stationary while those in front are upon rollers, which permit the boiler to expand and contract independently of the brickwork.

In operation all the water converted into steam in the inclined tubes passes rapidly upwards and separates from the water in the upper row of headers. The steam entering the super-heating tubes, in its passage to the steam drum, becomes thoroughly dried and super-heated, and if from any cause water should be entrained, the separation is perfected upon reaching the steam drum, as the water falls immediately to the bottom, whence it is returned to the water drum through the steel nozzles, and in turn to the sections and inclined tubes.

There are in this boiler no joints exposed to the direct action of the fire, and it is claimed that, throughout, the construction is such as has been dictated by experience with this class of boilers. Provision is made for the inspection of every part, and to prevent the deposit of scale in dangerous situations.



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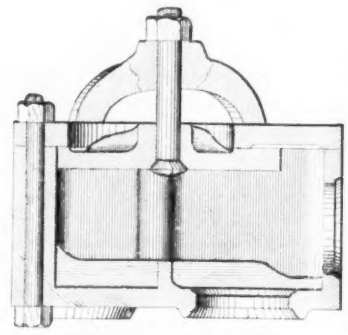

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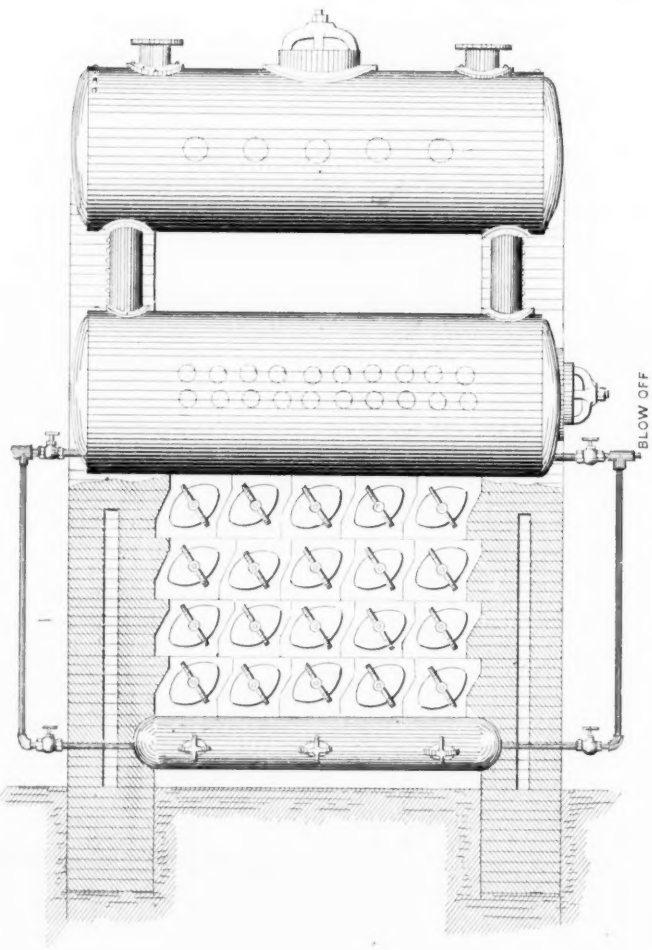
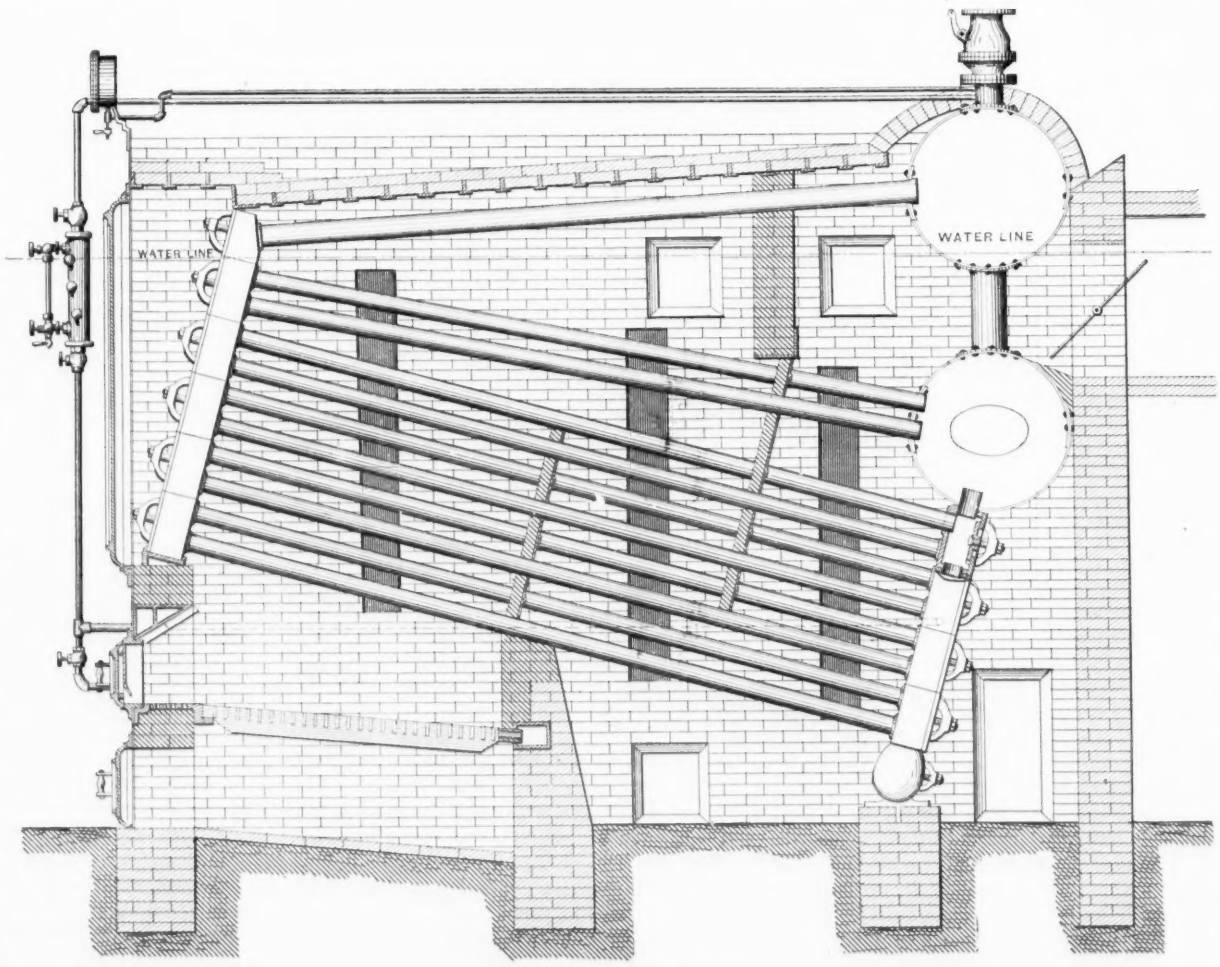




Zell's Water Tube Boiler.

This boiler is manufactured by Zell & Burton, Baltimore, Md. L. B. Eaton is general Eastern sales agent, office at 22 Courtlandt street, New York.

Crosby Indicator in Britain.

Engineering, in a recent issue, devotes nearly two pages to illustrations and description of the Crosby Indicator, and many complimentary expressions are made in favor of this American instrument. We quote from the description: "In America, the practice of selling engines by their indicated horse-power, rather than by a conventional standard, has given an impulse to the manufacture of high-speed engines. At the same time it has increased the difficulty of getting satisfactory diagrams, and has produced a demand for an indicator which can be relied upon to give trustworthy results at velocities at which hitherto nothing but approximate figures could be obtained. To meet this demand, the Crosby Steam Gage and Valve Company, of Boston, Mass., have brought out the indicator represented. To obtain the necessary rapidity and delicacy of action the weight of the moving parts has been kept as small as is consistent with the necessary strength, and the space over which they move has been reduced as compared with the stroke of many indicators. At the same time a number of improvements of details have been introduced, all tending to insure accuracy in results."

After going over details of construction, and commending the performance of the instrument, as shown by diagrams taken from high-speed engines, the article concludes: "We may say that the Crosby Indicators we have examined are admirably finished, and trials we have made with one of the instruments have shown it to be exceedingly handy to use."

Franklin Institute Report on the Shaw Locomotive.

A committee of the Franklin Institute, of which W. Barnet Le Van was chairman, was appointed over a year ago to examine Shaw's four-cylinder locomotive, and report upon the same. The report, which has but recently been signed by the members of the committee, has been made public. It will be remembered by our readers that we illustrated the Shaw locomotive in issue June 18, 1881.

The committee indorse the correctness of the principle adopted for counterbalancing the momentum of the reciprocating parts, but they are not prepared to say how far such advantage compensates for increased complication. They draw attention to the fact that the employment of four cylinders, arranged in pairs, is not new, and that the "duplex" exhibited at the London Exhibition of 1862 was constructed on that principle. The committee experimented with the engine, running on blocks at a high speed, and they testify to its great steadiness under the trial. They wished to test the correctness of the claims that this locomotive did not, at high speed, assume the functions of a sledge and strike quick blows on the rail, as is alleged to be the case with the ordinary locomotive with counter-balance weights in the drivers. As the owners would not assume the cost of carrying out this experiment, it was abandoned.

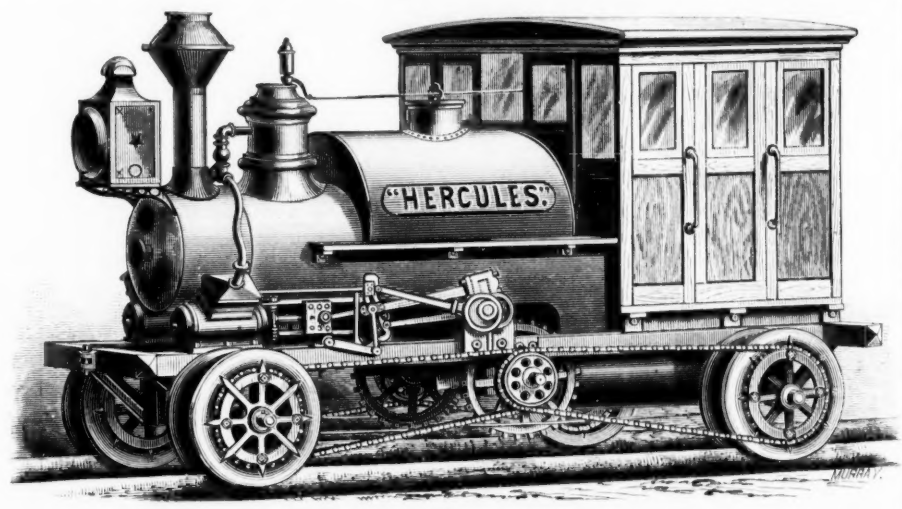
The report concludes by saying that while they recognize the merits of a balanced en-

gine, the committee do not feel justified in asserting that the practical advantages of a four-cylinder locomotive are sufficient to commend it in substitution for the standard construction, nor do they consider that the application of balanced engines to a standard locomotive, or the specified improvements invented by Mr. Shaw possess material for substantial value as compared with the full embodiment of the principle of balancing in question, which is found in the engine "duplex," before referred to.

Cole's Patent Pole Road Locomotive.

This locomotive, shown in our engraving, has been designed specially for use on cheap logging roads. The necessity for a cheap road, where steam power could be applied, has long been felt by many lumber men, but the great obstacle to be overcome was the want of an engine that could be run on a track where no iron was used. The Cole patent locomotive has supplied this want. In the lumber regions the cost of a pole road is nearly nominal. The service of a locomotive capable of being worked on cheap pole roads is likely to bring much timber to the hands of mill-men that has hitherto been lying out of reach.

The upper part of the engine is not unlike many small tank locomotives that are used for ordinary switching purposes. There are two cylinders, 7″x10″, which are placed above the frame beside the smoke-box, and all the parts of the valve-motion are located above the frame. The main rod transmits the power to what is called the "engine" shaft, which carries pinions that engage with spur wheels on the "master" shaft. The spur wheels have sprocket wheels on the ends of the axle, and sprocket wheels are also bolted to the outside of the carrying wheels, which, by means of endless chains, are converted into drivers. This arrangement multiplies the power of the engine four or five times at the expense of the speed, but enough traction speed for the work can easily be made. The wheels are sheave-shaped, to fit the poles on which they run, and have a lateral play of four inches on the spindles of the axles.



COLE'S POLE ROAD LOCOMOTIVE.

The drivers being independent of each other, and connected with flexible gear, can play up and down, in and out, according to the irregularities of the track, without dangerously straining any part. The valve gear is of the shifting link type, the valve stem being attached directly to the link-block.

The claims made for this engine are, simplicity, durability, and great power for the weight. They are manufactured by Adams & Price, Locomotive and Machine Works, Nashville, Tenn.

Sectional Boilers for Use at Sea.

A recent writer for the *New York Times*, who seems to have considered the subject with a care not always exercised by writers for the daily press on such matters, strongly advocates the use of sectional boilers for marine purposes, and arraigns the inspectors for passing boilers of a greater thickness than that prescribed by law—$\frac{26}{100}$ inch—between fire and water. The attempt to get a bill through Congress preventing the use of material thicker than this he characterizes as unfair, inasmuch as it should be designated "A bill to enable steamship owners to obtain an increase of speed and economy at the risk of their passengers' lives." He claims that the desired ends can be reached by slight modifications of some of the existing types of sectional boilers, and that it has been demonstrated beyond question that fire-brick furnaces can be satisfactorily used at sea. This assertion he fortifies by the statement that in an ocean steamship plying between New York and New Orleans, brick furnaces were substituted for the stayed water slabs, the result being that although the heating surface was materially reduced, an absolute saving was effected. These boilers, he writes, have been running many months, and, so far as the furnaces are concerned, have given no trouble. His conclusions are, that the water tube boiler is the coming marine boiler, and that with it 150 pounds pressure can be carried, while the safeguard of thin metal exposed to the fire will be retained. This, he considers, will be as great an advance as raising the pressure from 60 pounds to 110 pounds, by the substitution of steel for iron.

More About Fink's Wonderful Lubricating Mixture.

In our March 22d issue we published letters from several manufacturers who had purchased rights to use the Fink lubricator, all of them relating unfavorable experience both in their transactions with Henry Fink & Son, the owners of the patent, and with the mixture itself. We gave these letters a place in our columns entirely in the interest of our manufacturing constituents, in order to protect them against what we deemed to be a very clever deception. Since then we have received many more communications in the same tenor; also three from parties whose experience has been more favorable with Fink's mixture. These three letters we publish below, in order to give Messrs. Fink & Son the benefit of whatever is shown in their favor. The letters were called out in this wise: We received a few days ago a letter written at a Chicago hotel, and signed "J. Fink," requesting, on one page, a prompt answer to be addressed to the writer at the Arlington Hotel, Washington, and, on another page, to be addressed to the National Hotel, Washington. In that letter we were asked to contradict the testimony of the many letters we have already published, and to publish eight alleged testimonials, undated copies, but not the originals, of which were enclosed. We wrote to the eight establishments mentioned, and have up to the time of going to press received replies from only three of them, which we present below. We have also received a letter from "Henry Fink," written from Aurora, Ill., in about the same tenor as that received from "J. Fink."

EXPERIENCE OF ESTABLISHMENTS THAT HAD GIVEN FINK FAVORABLE TESTIMONIALS.

Providence, R. I., March 25, 1884.

Editor American Machinist:

Your letter of yesterday's date is at hand enclosing copy of our letter of recommendation of "Fink's Patent Oil Mixture," and asking our confirmation of the same.

In reply thereto will say that after repeated solicitations from Mr. Fink, after several months' trial, we gave him a letter of recommendation. We kept no copy thereof and hence cannot vouch for the accuracy of that which you send. We did, however, state that we were using it for certain purposes (not for all for which he claimed it to be adapted) and we continue to use it.

The preparation consists of a mixture of oil and water, and inasmuch as there is always a waste of oil during the process of "oiling up," the economy consists in the fact that with this mixture the waste is not pure oil.

It resolves itself therefore into a question of price, and upon the *sum paid by us* for the use of the patent mixture there is a perceptible percentage of profit, although the price claimed for it, and actually paid by many parties, is in our opinion very exorbitant.

We thank you for sending us the copy, thereby giving us an opportunity to explain our position in a matter where such a general dissatisfaction is felt by the various purchasers. Respectfully yours,

(Signed) GORHAM M'F'G CO.
Wm. H. Crins, Pres.

American Machinist Pub. Co.:

Your favor of the 24th is duly received. In reply we have to say, that the letter referred to is a true copy of ours to Messrs. Fink & Son, Oct. 30th, '83, and is all right as far as it goes, but Messrs. Fink & Son do not produce our previous letters to them condemning the mixture as a lubricator, and stating to what our use of it is really confined. We use it only with lard oil for heavy and rough milling, and do save, as stated in our letter, from 1½ to 2 barrels of oil per month. As a lubricator, or for drilling or threading purposes, it is useless, as our first trial clearly demonstrated. Yours respectfully,

WHITNEY ARMS CO.,
New Haven, Conn.

New York, March 27, 1884.

American Machinist Pub'g Co.:

We have received from you the copy of certificate we gave to Messrs. Fink & Son recommending their oil mixture. It is true we gave a certificate, but since that time have not been able to make the mixture work successfully, and some time since totally retracted our recommendation contained in the certificate, and would not now recommend it at all. Yours truly,

BULKLEY, DUNTON & CO.,
74 John St.

We publish below two of the voluntary letters we have received since our issue of March 22d was sent out. Want of space this week prevents our publishing others of like tenor.

MORE UNFAVORABLE EXPERIENCE.

Office New Orleans Gas Light Company,
New Orleans, March 22, 1884.

MESSRS. EDITORS: We were induced to purchase "Fink's Patent" oil mixture through several seemingly authentic recommendations from gas companies and others, with whom we are acquainted. Before purchasing, I wanted to give it a few days' trial. He (Fink) could not wait, having pressing engagements in other cities; promised to call again soon, but have not seen him to date. A few days' trial showed the mixture to be useless for our purpose. He also victimized other parties in this city.

Yours truly, FRANCIS CARROLL,
Manager Gas Works.

Augusta, Ga., March 13, 1884.

Editor American Machinist:

In December, 1877, I bought for $90 the Fink Oil Mixture formula. I have kept quiet about it ever since, as I felt rather cheap when I found out how badly I was swindled. As I now find I have such distinguished company, I will join the procession of victims. Yours truly,

JOHN S. COOK, M. M., Georgia R. R.

P. S.—I can furnish the details of our experience if wanted by any one. J. S. C.

A compound has just been patented as a preventive of boiler incrustation, the mixture consisting of concentrated lye, rosin, and alum. We are satisfied that with certain water impurities this patent compound would make scale, instead of preventing or removing it.

Mr. Buchanan, superintendent of machinery of the New York Central Railroad, is experimenting with a smoke-consuming arrangement of his own. The device is an improvement on the old air-jet arrangement. He injects four jets in the front of the fire-box and the same number at the back, the air entering nearly level with the surface of the fire. Superheated steam is used for operating the jets, the superheating being done in a coil of pipe arranged inside the fire-box.

LETTERS FROM PRACTICAL MEN.

What is Centrifugal Force?

Editor American Machinist:

The very courteous letter of Mr. Trautwine, in your last issue, seems to put me on the defensive. While inclined to proceed peaceably on my way, I find myself deflected into a discussion.

Like most other discussions, this one is only about words, while both parties mean the same thing. It will probably be in order, then, for me to define what I mean by the words I have employed.

All the confusion of thought about this subject, and the darkness that has been made deeper by each explanation of it, seems to have come from the wrong ideas which are generally attached to the two words "centrifugal" and "force."

Let us take up the latter word first. It is very true that, as Mr. Trautwine observes, a resistance is a "force;" and in this sense of a resistance, and in this sense only, centrifugal force is a "force."

But it belongs to that class of forces which tend to produce rest; it is *vis inertia*, the force of inactivity, the opposite of dynamical energy, and that which this energy is always exerted to overcome. In dynamical engineering this is not known as the force, but as the resistance.

When the term "force" is employed in mechanics, the idea at once attached to it is the idea of energy exerted to overcome resistance, and to produce motion. In this sense, centrifugal force is not a force, but its opposite, the resistance, the disposition to remain at rest—that which force must be exerted to overcome.

This distinction is certainly a very clear one. To emphasize it, I thought it necessary to say, using the term in its dynamic sense, familiar to all, that what is commonly termed centrifugal force is not a force.

I also objected to the word "centrifugal" because the tendency of a revolving body is not centrifugal. This word means flying from the center. Now, the body does not have a tendency to fly from the center, but from the circumference—not to move in a radial line, but in a tangent.

Beyond all question, the term "centrifugal" has a tendency,—which is very strong and needs to be resisted,—to convey an entirely wrong idea of this action.

It is thus obvious that, before one can form a correct notion of the action that is really taking place in a revolving body, he must entirely disabuse his mind of the ideas which are usually attached to these two words.

With this brief reply, in which I confine myself to what seems necessary for the elucidation of the subject, I must dismiss it, referring any future critics back to a more careful examination of my former articles, to which I can add nothing more.

CHAS. T. PORTER.

New York, March 26th.

Errors in the Repairing and Setting of Boilers.

Editor American Machinist:

In your issue of March 22d, "W. H. N." described the method employed ("by our foreman of boiler shops") in putting in a set of flues, which he thinks is deserving of place among your "shop kinks." Permit me to say, for the benefit of your readers, that the method described is a very old one, and the reason why your correspondent finds it new is owing to the fact that the practice is followed now to hide defective calculation in aying out the shell of boiler to correspond with the flues ordered, or from a crooked boiler head, more than from any other motive.

Unequal surface of the front or back of a boiler, and inability to straighten short kinks, will at times make some of the flues too short. In such case the expansion dodge has been resorted to for the past twenty-five years.

The practice is a pernicious one, as where flues are put in by this method an unequal strain is caused, and injury is apt to follow. Years ago, when the art of straightening flanged plates was almost unknown, or confined to a very few expert flange-turners, boiler heads were drawn in and pushed out to a true line by means of bolts and "strong backs." This custom continues in many places even to this day, but the folly of the plan should be apparent to a mere novice, as the strain thrown on some flues, in addition to the working pressure of steam in the boiler, is beyond calculation, and in many cases has been attended with disastrous results.

The fewer of such "shop kinks" we use in practice the better it will be for all concerned, and until such tricks as that described are entirely abolished, boiler making and boiler makers will retain, and deserve, much, if not all, of the censure now so freely bestowed upon them.

In the same issue, "W. E. Crane" refers to my article in No. 4 of present volume, and asks: "Is it best to have the damper at the bridge wall, or in the flue at the end of the boiler?"

In the article referred to I merely stated that proportioning space between the bridge wall and bottom of shell was not fully understood by boiler builders and engineers, and your correspondent, by giving the statement of "the boiler firm in the New England States," fully corroborates my assertion.

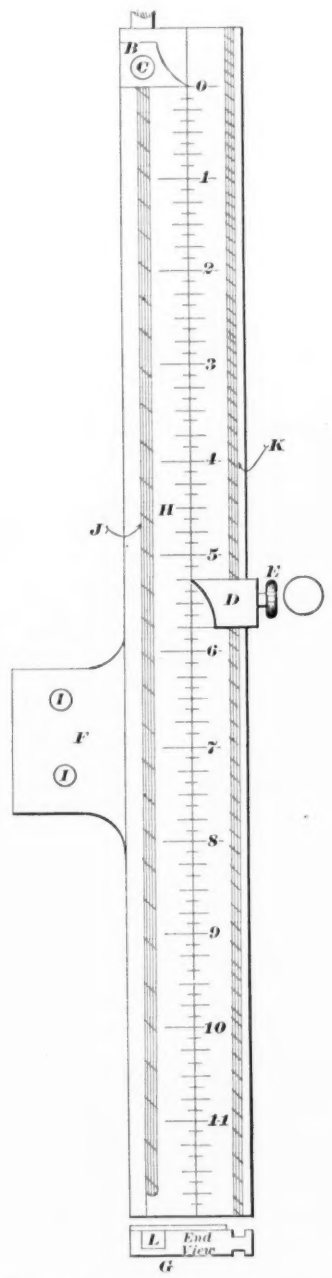
Replying, however, to Mr. Crane's question, I would simply say that if the products of combustion, *to a certain extent*, can be retained under the boiler, they are of necessity of much more effect than when allowed to pass beyond the limits of usefulness, namely: "the flue at the end of the boiler."

The assertion I made in No. 4 was not, however, a theoretical one, as experiments had been made to demonstrate the utility of bridge walls by engineers of ability and education, and where such experiments were made the maximum and minimum of utility have been demonstrated beyond question.

Experiments of this nature are seldom, if ever, published, and this accounts for the lack of knowledge we possess on matters of this kind. While I am very reluctant to refute the claim made by my co-laborers in the New England States, I am still of opinion that a bridge wall is of more importance than simply to form a fire-box, and the discussion of the question may be the means of causing some of your engineer readers to experiment in this matter for their own benefit, giving their experience to steam users through the columns of the American Machinist, as I think much light can be shed on this subject. I do not believe, however, that any rule can be applied to this subject, as every engineer must of necessity be governed by the circumstances in his own case. Still, I think that the agitation of the subject will be of vast benefit, not only to engineers, but to those who pay for the coal so extravagantly used in the generation of steam.

Your editorial on Boiler Setting, in No. 10 is, I think, pertinent to the whole question, and now that the agitation has commenced, I trust it may continue until some definite conclusion is reached.

Syracuse, N. Y. Geo. Marshall.



Depth Gauge for Drill Presses.

Melting in a Southern Foundry.

Editor American Machinist:

I read W. A. P.'s letter on "Management of Foundry Cupolas" with a great deal of interest, as I do all articles on foundry business published in your valued journal, and, although I may be young in years and experience compared to some of your contributors, I am going to venture an opinion.

For ten years past I have had charge of foundries, and in that time I have melted iron in cupolas ranging in size from 16″ to 72″ inside diameter. I must say the manager of the foundry W. A. P. writes of does not exercise what Mr. West justly terms "intelligent melting" to a very high degree. Unless there is something beyond W. A. P.'s reasons, it is the slowest and most extravagant melting I ever heard of. The writer of that article is correct about the tuyeres, but if they would use less coal in the bed, and not have to burn so much *out of the way*, I believe they would have better results, and I am sure it would not take one hour and a half to melt 2,600 pounds of iron.

Perhaps some of your readers would like to hear what we do in the melting line "way down South in the land of cotton." There is much of interest connected with this foundry here. It was used during the late war by the Confederate Government, and was called the Naval Iron Works. It is the largest foundry south of Richmond, Va., but of that I shall write at some future date. I intend now to write of the cupolas, of which we have two, standing side by side, having ½″ universal tuyeres. The fan is a home-made one, 48″ diameter. The casing of the fan was swept up as one would sweep up a pulley. It stands behind the cupolas, and is one of the best I ever saw. The large cupola is 36x60 inches inside diameter. The small cupola is 30″ diameter inside, and *one stack answers for both*. The stack is built on the large cupola. Directly above, and to the right of charging door of the small cupola, is an opening 18″ square into the stack of the large cupola. Above this the small cupola is arched over solid. For all heats under 12,000 pounds we use the small cupola, and I believe we have as great a variety of work as one generally finds in a foundry. For instance, in yesterday's heat we had a steamboat cylinder, pulleys, railroad castings, fine castings, cotton looms, hollow ware and grate bars, requiring different grades of iron. We figured the heat at 7,200 pounds, and had 60 pounds of iron left. For the bed we used 350 pounds of coal and 150 pounds of coke. We started the fire in time to burn through bright, and put on 1,200 pounds of iron; then we made charges of 600 pounds of iron and 70 pounds of coke, melting at the rate of 6 to 1. Blast went on at 4.30 and bottom dropped at 5.53.

Here we start the fire and put on blast according to size of heats, the object being to work as near to six o'clock as possible, shaking out, etc., being done by cheap labor at night. We melt all heats at the rate of 6 to 1. Better than this can be done on some work, but we have found it more profitable on our work to melt at that rate, and we have melted 5,400 pounds of iron in 48 minutes.

I like to hear from any one who writes on matters of interest to foundry men.

Robert E. Masters.

Columbus Iron Works, Columbus, Ga.

Depth Gauge for Drill Press.

Editor American Machinist:

Seeing a great deal in the American Machinist in regard to tools of all descriptions, I take the liberty of contributing a sketch of a depth gauge which we have been using for some time at the Westinghouse Air Brake Works on one of Bement & Sons' drill presses.

In the sketch is represented a $\frac{3}{16}''$ square brass rod extending from the top of the spindle down to the gauge, moving with the spindle. *B* is a steel pointer connected to the brass rod by a small screw—*C*; *D* is another pointer let into groove *K*. By means of the thumb screw *E*, this can be adjusted to any position. *F* is a piece of $\frac{1}{16}''$ sheet steel. *G* is the end view showing the three slots, one of them being the one in which the brass rod slides. *H* is a piece of $\frac{5}{16}'' \times 1\frac{1}{4}''$ steel finished all over, and graduated to $\frac{1}{16}''$. *I*, *I*, are screw holes for fastening to machine, and *J* is a slot for screw *C* to slide in. To use this gauge all that is necessary is to place the work on the table, run the drill down to the work, and then suppose, for instance, you want to drill a hole $2\frac{1}{4}''$ deep and that the pointer stands at 3″ on the gauge. You run the other pointer down to $5\frac{1}{4}''$, then in drilling when the pointer *B* comes to *D* the hole is $2\frac{1}{4}''$ deep. This is a great convenience and saving of time when a number of holes are to be drilled to the same depth.

W. G. S.

Allegheny City, Pa.

Tinkering an Engine Too Much.

Editor American Machinist:

"Engineer," in your issue of March 22d, thinks the man who wrote "Tinkering with an Engine" was not a friend to engineers, while it seems to me that he who tells us of our faults is the truest friend. A number of years ago, while making arrangements to take charge of an engine and boilers, the treasurer said he wanted "some one who is not taking things to pieces all the while to see how they were made." He said they had one man who took the engine to pieces so often that he wore the nuts and bolts all out, and they had to build it all over again. "Engineer" also thinks that it is only cheap men to which such remarks would apply.

I have in mind a man well educated, who could probably pass examination without trouble. He was hired by a firm who wanted a good man, and was paid $4 per day. He found things in very bad shape, and the first thing he "fixed" was to shift the eccentric on a Corliss engine to get his ideas of compression. He shoved it ahead, and added so much lap to the steam valves that they had to cut off at or before one-fourth stroke or not unhook at all. The engine was required at times to do 500 horse-power, and on such occasions would cut off at about one-third, if it had a chance; but, as it did not, it would follow as near full stroke as the lap of the valves would allow, and not infrequently so much steam was used in this manner that the condenser became hot and shut down the whole business.

The back-head had a nice ground joint perfectly tight, and he took the head off and put on Jenkins' packing. A Knowles pump had been built over just previous to his taking charge, and all joints reground. He took them apart, five of them, and "fixed" them the same way. On a Harris-Corliss engine he was doing some "fixing," and did not screw tight the jam nut that holds the piston rod into the cross-head; and, when the piston got to striking the cylinder head, he shut down and tightened it up. On this piston there were studs top and bottom to center the same and hold the piston up, but none on the sides.

In getting the rod back, so as to give clearance of the cylinder head, he left the side of the piston on the bottom so it had no support, and came near ruining an $80 set of metallic piston-rod packing. So I might go on and fill two or three pages of this paper. I am inclined to think there is too much "tinkering" and "fixing" of a certain kind.

Waterbury, Ct. W. E. Crane.

Requirements of a Good Lathe.

Editor American Machinist:

What is the best make of lathe is a question that is often asked, but which is hard to answer to everybody's satisfaction, as what would be a first-class machine for some purposes would not be a good machine at all for other kinds of work.

Each person buying tools must use his own judgment as to what is best adapted to the class of work he intends to do with the lathe. There are, however, some features that should be in all good lathes. Following are a few points as to what should constitute a good lathe that may be of use to those that have not had a chance to learn by actual experience. Descriptions of the different parts of lathes have been published in your valuable paper at different times, but I have not seen a description of an engine lathe as a whole before.

We will take the head stock first. The cone should be as large in diameter as can be used without making the head stock too weak. The steps should be wide enough to give the power wanted, but not so wide as to make it hard to change the belt from one step to another. The back gearing should be properly proportioned for equal changes of speed. For a great deal of work, I think that a five-speeded cone is better than four, as there is not so much difference in the various speeds, and the spindle is longer. The face of gearing should be of sufficient width to insure ample strength to stand all the strains they will be liable to be subjected to. The gearing on front end of head stock should be one pitch coarser than those on the back end. The spindle should be of sufficient diameter to give it the necessary rigidity to keep it from any tendency to spring or chatter, but not so large as to cause too much friction when running at its fastest speed.

Some builders make the back bearing or journal shorter and of smaller diameter than it should be. Having the spindles made hollow is of considerable advantage, and it is also the best way of knocking out the center. Changing the feed in the head stock from right to left is better than doing the same in the aprons, as when the apron is not wanted it can be thrown out of gear, thus saving so much wear and power. It also saves putting on extra gearing for cutting left-hand threads. Change gears should be of coarse enough pitch to stand the strains they will be subjected to without loosening any teeth. The tail stock should be amply heavy, with a long bearing on the ways; the spindle of large diameter and of good length for chucking purposes, and the screw long enough to

knock out center when the spindle is run back into the tail stock. Hand wheels are better than ball handles for screwing the spindle in and out, and they are better for chucking also, by reason of the fact that when the screw gets worn a little loose, a ball handle, on account of being out of balance, will drop down (the heaviest part), and so loosen up the center. I suppose a handle can be made so that it will balance, but I have not seen one yet that was balanced.

Splitting the tail stock and tightening together with a screw is the best way, as it closes the metal around the spindle. Bolts are better to tighten the tail stock on the ways than either eccentric shaft or cam (except on the very smallest sizes of lathes), as they are not so liable to slip back. I think it would be a good plan if tool builders would have the nose of tail stocks project from two to four inches, according to size of lathes, over the bottom part, as it would help to stiffen the spindle. The lead screw should only be used for cutting threads, and on lathes that are difficult to reach over the screw should either be on the front side or else controlled from the front side of lathe by some simple mechanism to open and close the nut. Rod and friction feed driven by belts is the best for the smaller sizes, say up to 24″ swing; and on the larger sizes the rod should be driven by gearing, with a clutch arrangement for feed instead of friction. I have never seen any arrangement for adjusting the height of tool that is equal to the double carriage with screw at the back for adjusting, and in the case of gibbed carriage the double ball-raising screw is by all odds the best, as it will not cramp in any position; but the disadvantage of only being able to get work of small diameter over top of carriage will often more than offset the easy adjustment of tool, in favor of the plain flat carriage with concave collar and convex shoe.

I do not say anything about the numerous patented tool blocks, as I have never seen any adjusting tool block that would stand the wear, and I have tried quite a number. I am inclined to think the patent tool blocks are like car couplings—a great many are patented, but none of them seems to be just what is wanted. The bed should be of ample depth and width, with plenty of metal judiciously placed, as it is only a waste of iron to put it where it will not amount to anything. The bottom of legs should be well spread apart to make the lathe stand stiff and rigid.

One of the most vital parts as to the good running of the lathe—and the one that is the most neglected—is the countershaft. Many tool builders will make in other respects a first-class machine, but when it comes to the countershaft they seem to think that anything will do for that; but actual experience has proved that a good countershaft has a great deal to do with the successful running of any machine. Marcus.

Balancing Locomotive Wheels.

Editor American Machinist:

It has been found upon the Pennsylvania Railroad and N. C. R. that a number of the old engines, built before the present standard wheel centers were introduced, have wheel centers improperly balanced, causing engines to ride unsteadily, the defect being quite noticeable on trains hauled by engines of this kind.

It would, therefore, be well, when repairing engines of the kind referred to, if opportunity offers, to weigh counterbalance in wheel centers, and, if found incorrect, to have the defect remedied.

For your information with relation to this subject, I would state that the following rule has been adopted by the P. R. R. Co. for determining proper counterbalance for locomotive driving wheels:

Find the separate revolving weight in pounds of crank-pins, crank-pin boss, coupling rods and connecting rod for each wheel; also the reciprocating weight of the piston and appendages and one-half the connecting od. Divide two-thirds of the reciprocating weight equally between the coupled wheels, and add the part so allotted to the revolving weight on each wheel.

The sums so obtained are the weights to be balanced at the several wheels.

Multiply the weights so found for each by the height of crank in inches, and divide by the distance in inches of the center of gravity of the space to be occupied by the counter weight.

And the method pursued in weighing counterbalance already in wheels is as follows:

Each pair of wheels is in turn supported on trestles, the axles resting on a pair of old guides, so that there will be as little friction as possible. (In the case of main wheels the eccentric straps and rods are left on, the front ends being swung from a trestle.)

A line bisecting the angle between the two crank arms is scribed on the outer face of one wheel, and on this line is clamped a long arm or lever, which projects about six feet from axis on the counterbalance side. The wheels are rotated, so that this lever becomes exactly horizontal, it being then supported at a definite distance from the center (60 inches) by a strut resting on a scale platform.

The load on the scale platform (less the weight of lower strut, etc.), multiplied into the arm (60 inches), gives in inch pounds the moment of counterbalance of wheels (with reference to a vertical plane) when in this particular position.

The proper moments of counterbalance, as above arrived at, are taken in reference to a plane, *A A*, at right angles to crank line; but the equivalent proper movements in reference to the plane, *B B*, for a single wheel are 707 of those for plane, *A A*, or 1,414 for a pair of wheels.

For the further information of your readers, I give below example in full of application of above to engine, N. C. R., 133, with two pairs of driving wheels, which was found to be riding unsteadily. A. Dolbeer.

Renovo, Pa.

Weight of reciprocating parts.

Pistons, complete	279 lbs.
Cross-heads	109 "
Front end main rod	130 "
	518 "

Weight of revolving parts.

Back end main rod	142 lbs.
Front end side rod	122 "
	264 "
Back end side rod	122 "

Moments to be Counterbalanced.

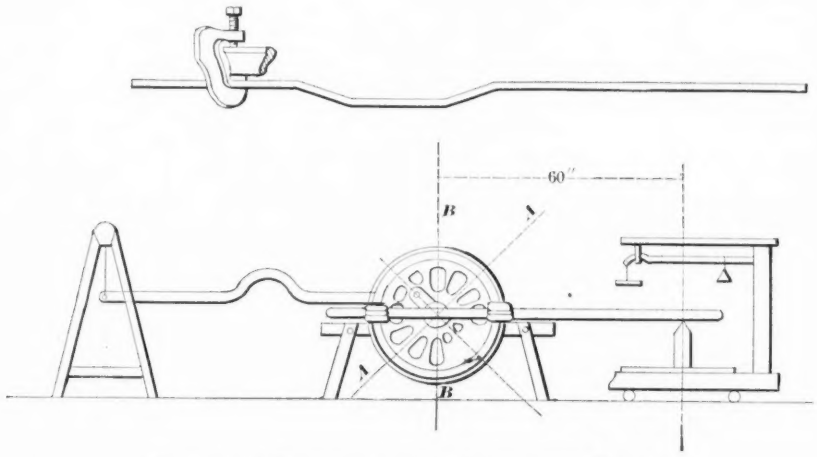
	Main.	Back.
Statical effects of rods	264.	122.
One-half of two-thirds weight of reciprocating parts	173.	173.
Total virtual load on each pin.	437.	295.
Length of crank in inches	12.	12.
Proper moments about plane *A*, *A*, per single wheel	5244.	3540.
Proper moments about plane *B*, *B*, for a pair of wheels	7415.	5005.

Observed Moments of Counterbalance by Weighing.

Load on scales (less weight of lever, strut, etc.)	45.	58.
Length of arm in inches	60.	60.
	2700.	3480.

Comparison of Moments and Deficit of Counterbalance.

Moments about *B B*, as they should be	7415.	5005.
Moments about *B B*, as found to be	2700.	3480
Deficit in moment about *B B*, for pair of wheels	4715.	1525.
Deficit in moment about *B B*, for single wheel	2357.5	762.5
Deficit in moment about *A A*, for single wheel	3333.	1078.
Approximate deficit radius of counterbalance 20½	162.	52.



Device for Counterbalancing Locomotive Wheels.

Water Glass Cock Patented in 1870.

Editor American Machinist:

In No. 11 of your paper you describe a water glass cock, with an automatic-closing ball valve, as the invention of John Player, mechanical engineer of the New York, West Shore and Buffalo Railway. I beg to say that this device was on trial for a short time on engines of the Austrian North-western and other Austrian railroads in 1871 and 1872. So far as I can remember, it was found at the time that the valve chambers and valve seats showed an incrustation of scale in a short time, which was sufficient to prevent the valve from closing perfectly in cases where the glass did break. The device was invented by Ernst Schebesta about 1870. The inventor took out a patent in Austria at that time. Anthony Victorin,

Member Technical Society, Chicago.

Not a New Invention.

Editor American Machinist:

In your issue of March 8, I see an ingenious description and illustration for keeping the "Prony" brake cool. I send you a reprint from *Engineering* of 21st of April, 1882, from which you will see that I had already invented and used this arrangement more than three years before Messrs. Mitchell & Aldrich used it, and it is probable that others used it before myself. Druitt Halpin.

9 Victoria Chambers, Westminster,
London, S. W.

Experience with Inspectors.

Editor American Machinist:

In the American Machinist No. 13, vol. VII., is an article by Mr. C. S. Beach on licensing engineers. Being from 1858 to 1861 an engineer on inland lakes, I have had some experience with United States inspectors. In 1858 I was working in a shop where a good deal of steamboat work was done, and was offered a job to run a boat that only carried one engineer, the run being about 100 miles a day. As the inspectors were not up there more than once or twice during the season, I had no opportunity in starting out in the spring to obtain a license. The boat was owned by the Milwaukee and Horicon Railroad. They had five boats in the line running on Lake Winnebago and the Wolf and Fox Rivers, the superintendent's office being at Oshkosh. He offered to be responsible for my running without license until an inspector came around. One morning in June, about 5 A. M., the captain came to my room, woke me up, and told me that Mr. Strong, an inspector (from Detroit I think it was), was in the cabin and wished to interview me. As soon as dressed, I went into the cabin and was introduced to him. He asked me if I was the engineer of the boat; I answered yes. He asked to see my papers; I told him I had none, and had had no opportunity to get any. He then asked me if I knew I was liable to be prosecuted; I told him the superintendent was responsible for my shortcomings. He then produced a blank application, and in answer to his questions as to my qualifications, experience, etc., he filled it out, and told me to go and get the signatures of two licensed engineers and one pilot. There were several boats lying at the docks, and in about 15 minutes I returned to him with the paper duly signed. He then commenced to question me about my knowledge of engines, boilers, steam, water, etc. One of the engineers who had signed my application came in, and, as I hesitated some in answering, this engineer prompted me, stating it was usual for the old engineers to help the young ones along a little. This Mr. Strong objected to, and said that as I had been running on my own responsibility for three months, I must get my license on my own merits, and gave me an invitation to go to his hotel with him. Of course I went with him, feeling "like a lamb going to the slaughter." At his room he opened his batteries on me again, and continued his siege for about an hour. By this time my fireman had steam up, and, as it neared our leaving time, they were whistling. Mr. Strong asked me if that was my boat whistling, and I told him it was. He then said he had not given me as good an examination as he wished to, but handed me my license. By this time I had found I liked his company very much, and that I had received some splendid ideas about steam that had never been plain to me before, so I told him that he would have two hours to wait for a train at Berlin, had no connections to make before arriving there, and if he desired to do so, I would like some advice from him, as I was only a young man and had a good deal to learn (I was not 21 then). He told me I was the youngest man he had ever given a certificate to to run head engineer. In the next half hour he gave me some of the best advice I ever received about steam, etc., and he did not forget to advise me in reference to morals. As to engines, I do not think I have since that time met any one who could talk engine as he could; in fact, he was the very opposite of the inspector Mr. Beach mentions. I hope in the future to give you some of my experience at times when I had my boilers tested. There was a motto hanging in the shop where I was apprentice, that "A poor workman quarrels with his tools," and as, since that time, I have had many peculiar jobs to do, and but few tools to do them with, perhaps some of my shop experience may be of interest. Samuel Clark.

Abusing Tools.

Editor American Machinist:

I was very much pleased with Frank H. Richards' article on running a lathe, in which he gives his opinion of people who abuse tools. Abusing tools here is a fine art, and men are rated not by the quantity of work they do, or its quality, but by the number of bangs and bruises they can put on a lathe or planer. In a shop where I was working recently, the foreman told me to use a sledge hammer to unscrew a four-armed face plate from a nearly new lathe. I made a remark that it would break, but he said it was handier to have one arm broken off. There is a shop (say in this State) the superintendent of which is a blacksmith helper by trade, and the foreman does nothing but wheel castings, so that he is called the "snagger" in the shop. They recently built a 10″x20″ engine, with an Allen valve, balanced, and they made the exhaust port with an area of forty square inches to counterbalance the pressure on the back of the valve. They made in all about a dozen valves before one would work, and the workman who made the first one was accused of making all the trouble, and was required to pay for a part of the first. Frisco.

San Francisco, Cal.

A correspondent asks for the actual experience of some one in using chilled slide valves. Our experience with them has been unsatisfactory. Has that of any of our readers been better?

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NEW YORK, APRIL 12, 1884.

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Successful Humbuggery.

It is not flattering to the mechanical skill and genius of this country that at almost any time a half dozen schemes may be found in successful operation, the only basis for which is something mechanically impossible, and the only objects of which are to induce credulous people to part with their money. In favor of all such schemes claims so extravagant are put forward, that it would seem that if the protesting did not stamp them as frauds, it would at least make those who are anxious to get a good deal for their money, cautious. The willingness with which the projectors propose to give strangers a chance to make "millions" might naturally excite suspicion, but this does not seem to be the case. On the contrary, apparently, the larger the humbug the more probability of its success so far as raising money is concerned, which is, of course, all the success that is expected. Why this thing is worked more successfully here than in older countries is not because there are more dishonest people ready to engage in it, but because it is easier of accomplishment here. The reason for this is because, as a people, we are given to relying upon our own judgment in matters we know nothing about. This every-man-his-own-doctor system which so largely prevails in this country is exactly what suits those who want to float some mechanical swindle—something that will not bear opening to honest, competent investigation. It would be very nice if every one were competent to judge correctly of things with which he has no acquaintance, but it is a fact that no one can do so; and this fact, coupled with the other that he is very apt to think he can, is the principal reason why so many "promising" schemes in the line of mechanical matters are worked.

The remedy for this is simple enough, but few seem inclined to apply it. It is, as we have before pointed out, that when a man has an inclination to invest in something of which he has no special knowledge, he *pay* some one who is competent to advise him. The fact that in older countries this remedy is generally used, while here it is not, is the reason why it is so difficult there to get money advanced upon a basis of plausible generalities, and, comparatively, so easy here.

It does not signify to take the colored accounts of the daily press as conclusive. So far from this, when anything in the mechanical line is *exploited* by this means, it is always particularly wise to investigate with increased care—or let it alone on general principles. We fail at this time to recall an instance in which anything of the kind that turned out to be valuable was first brought to notice in this way. Such accounts are not infrequently *apparently* backed by the opinions of mechanical experts, but generally the *ifs* and *buts* that properly belong to the testimony do not find their way into print. At any rate, testimony appearing in this way should no more be used as conclusive, than one should copy for his own use, and to save the doctor's fee, the prescription his neighbor paid for. The only satisfactory plan is to get honest opinion, and pay for it honestly. When objection is made to the proper examination, it is wise to let the matter quite alone, so far as investing in it is concerned. The exercise of a little more judgment in *not* investing in some of these schemes would save investors a good deal of money, and establish better credit for national common sense in mechanical matters.

Our Iron and Steel Trade With England.

While free-trade newspapers are laboring to convince their readers that our protective tariff is a serious check upon the ability of American manufacturers to export goods, especially of iron and steel, it is well to consider the facts set forth in the following paragraph which appears in the last issue at hand of the *Machinery Market* of London:

Although our exports of machinery and hardware to the States have slightly increased, taken on the whole during the last few years, our exports thither of iron and steel and their manufactures show a marked decline during recent years. The value under this heading amounts for the month of January last, to about £395,000. It appears, therefore, on the whole we are buying nearly as much in the way of manufactures in iron and steel, machinery, etc., from the States as we are selling to them. The result must be looked upon as miserable, and is not equal to our position as a manufacturing country. The United States is a producing country, not a manufacturing, in the sense to which we apply this term to ourselves. It is high time we turned our attention actively elsewhere for a better customer, not forgetting all the same to watch the opportunities which the tariff reduction in the States will open out to us.

In view of our large proportionate exports of iron, machinery and metal goods to Great Britain, a disinterested foreigner might regard the United States as becoming something of a manufacturing country. The logic of events will in time convince John Bull that it is much more than a mere producing country. We advise our friends on the other side of the water not to trust much of their future export trade to a probable reduction of our tariff. The American people will never rest quietly with our mills, factories and workshops closing up for want of orders while importations from England increase. The House of Representatives is elected anew every two years, and if its members pass tariff bills in the interest of foreign industries as opposed to our own, the people will certainly apply the remedy by sending representatives who will legislate in directly the opposite direction.

The new British patent law, which is much more liberal to inventors than the old law has already operated to stimulate invention to a remarkable degree. The total number of applications for patents for seven weeks ending February 18, this year, was 3,538, while for the same period last year it was only 894. The total of applications for 1883 was about 6,000, the highest on record. Just as the British are beginning to experience the value of liberal protection to inventors at low cost, our legislative Solons at Washington are trying to carry out some plan to weaken or destroy the protection now accorded to American inventors.

Effect of Threatened Patent and Tariff Legislation.

W. F. & John Barnes, Rockford, Ill., write us: "We enclose you a copy of a letter from one of our correspondents (you can judge from his letter how near a customer) that shows about how it affects this class of American citizens. By the time politicians out of office and in get the patent and tariff laws to suit them, this country will be ready to divide up into another Africa."

The letter referred to reads as follows:

Messrs. W. F. & John Barnes:

Gentlemen: When I wrote you for your catalogue I thought of ordering your No. 5 lathe and other machinery, with which I expected to perfect some valuable mechanical inventions; but since Congress seems disposed to enact such hostile patent bills, I have concluded not to waste my time and money.

Thanking you for your kindness in sending catalogues, I am,

Yours truly, Joseph P. Wilson.

If we can judge by the speeches of certain prominent Congressmen, both in and out of legislative halls, the squeezing of some of our most useful and valuable manufacturing interests is just what a considerable number of them desire. Goaded by the editorials in free trade newspapers, they rancorously abuse the iron, steel, machinery, woolen, and silk manufacturing interests, and loudly demand laws to make foreign competition easier and home manufacture less remunerative.

In no other country in the world are any number of legislators, or is any portion of the popular press, hostile to manufacturing interests. Here a certain class of editors and statesmen are laboring to destroy the patent and tariff protection, under which our manufacturing industries have been built up to their present proud position. They call a halt to our industrial progress, while foreign manufacturers are waiting for the opportunity thereby afforded to crowd our markets with cheap goods and force down wages and selling prices to a point where our shops and factories can make no profit in running, and will shut down.

There is no doubt that a majority of the people of this country are in favor of adequate protective patent and tariff laws. If legislation by the present Congress is not shaped in accordance with that fact, a considerable number of its members will be placed upon the retired list when another Congress is chosen, next fall.

Improved Method of Counter-Balancing Locomotive Drivers.

The proper weight needed for locomotive driving wheels to counter-balance the reciprocating parts has never been satisfactorily formulated in this country. The deductions from Clark's experiments made in Britain many years ago are still the only recognized authority here for counter-balancing driving wheels, and in many respects they are absolutely untrustworthy as applied to American locomotive practice. Probably the Clark counter-balancing rules are responsible for many of the badly balanced wheels that are pounding the engines and track to pieces all over the country to-day. Many master mechanics and builders have become aware of the fact that the Clark figures will not produce satisfactory results, and a sort of rule-of-thumb method of counterbalancing has been growing into practice. Exact data founded on correct theory and demonstrated to work satisfactorily in practice, will be welcome to many railroad men. This we present in another page, in a communication on balancing locomotive wheels, from Mr. A. Dolbeer, general foreman of the Pennsylvania Railroad Shops, at Renovo, Pa. Mr. Dolbeer has worked this mechanical problem out in a thoroughly scientific manner, and we are satisfied that his method will give the best results. There are few worse or more expensive defects than badly balanced driving wheels, and many master mechanics will find it a good investment of labor to overhaul their driving wheels under the light of Mr. Dolbeer's experiments.

In the schools of Newton, N. J., daily newspapers have been substituted for reading books. We hope the teachers will make careful selections of reading lessons. For instance, the first reader class might exercise on the short-item columns until the pupils are familiar with the methods of calling village and ward primaries and caucuses, and the progress of quarrels among small political bosses. The second reader boys and girls could be drilled in accounts of domestic scandals, carefully gathered from different parts of the country. Third reader pupils could study for elocutionary exercises the records of crime and casualty, giving especial attention to murder cases; while the fourth reader class could practice upon the longer articles, chief among which are interviews with political wire-pullers, relating their opinions about presidential candidates, how best to straddle the tariff question, and the choice of delegates to Chicago. The daily newspaper is truly the "great educator."

Literary Notes.

SHAVINGS AND SAWDUST. BY "OBSERVER." Comprising a series of articles which have appeared in "The Lumber World" for the past two years, and are now revised; together with many others which have not been published; all treating on the Designing, Construction, Care, and Operation of Wood-working Machinery. With Illustrations. Publisher, C. A. Wenborne, proprietor of *The Lumber World*, Buffalo, N. Y.

It may be well to say that "Observer," the author of this work, is John Kane, well known as one of the members of a firm engaged in the manufacturing of wood-working machinery in the central part of this State; hence, as might be expected, the subject is treated entirely from the practical standpoint. The book is written in a pleasing conversational style, bristling with good points that the reader can take in while enjoying the humor with which they are sandwiched. It treats of the things that those

engaged in the use or construction of wood-working machinery are interested in, and contains information valuable alike to the owner, purchaser, and user of such machinery. It is a fact, and a curious one, that little has been written upon this subject, notwithstanding its importance, and we predict that the effort of the author will be accordingly appreciated. It should have been stated that Mr. Kane's experience embraces the operation as well as the construction of wood-working machinery, consequently we find he begins at the bottom by an illustrated description of a factory, and follows it up by treating in detail its belongings, including repairs of machinery as well as its use. Some of the "awful examples" are in particularly happy expressions, and show that the author believes that to become thoroughly impressed with the way a thing ought not to be done is sometimes about equivalent to knowing how to do it. The price of the book, postpaid, is $1.50.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(157) D. W., New York, asks: Is it possible to use soapstone dust for a mould in which to cast gold finger-rings? *A.*—It seems probable that it might be used for this purpose. We have no knowledge of its having been tried.

(158) J. J. H., Washington, N. J., asks: How can I blue small screws evenly? *A.*—A very good way is to fill an iron dish with wood ashes, put the screws in the ashes and heat the whole. This heats the screws evenly. Sometimes sand, and sometimes charcoal, broken up fine, is used instead of the ashes.

(159) C. A. F., Lowell, Mass., asks: Can a saw be made 4″ or 5″ diameter, 3-32″ thick, that will cut up wrought iron shafting to good advantage, and at what speed should it be run? *A.*—You can probably run such a saw about 25 feet peripheral speed per minute. It will not be found a very satisfactory plan for cutting up shafting.

(160) O. S. V., Glasgow, Mo., asks: 1. What should be the area of steam ports for a 2½″x 5″ engine? *A.*—Half a square inch will do very well. 2. What should be the size of steam pipe? *A.*—If not too long, make it ¾″. 3. Would an upright boiler, 14″ diameter and 3½ feet high, furnish sufficient steam? *A.*—It would be better to make the boiler not less than 16″ diameter. 4. What will be the power of such an engine? *A.*—300 revolutions, 70 to 80 lbs. boiler pressure, about one-horse power.

(161) W. J. M., East Saginaw, Mich., asks: What will be the difference in the discharge of steam by two safety valves, one a 3″ "pop" valve and the other a 6″ ball and lever valve: *A.*—It is difficult to make an intelligent comparison: If it comes to keeping the steam pressure within certain limits, say that it shall not increase more than 2 lbs. after the valve begins to blow, we should say the 3″ "pop" valve, as compared with the ordinary 6″ ball and lever valve would be ten times as effective. Under almost any circumstances the 3″ "pop" valve will be much more effective than the 6″ ordinary valve.

(162) C. S. R., Bennington, Vt., says: An engine on one of the leading railroads was fitted with the Richardson balance valve, when it was found that she would not run down hill with the steam shut off, which she used to do as well as any when fitted with the old D-valve. After fitting relief valves to the steam-chest the difficulty was entirely removed. Now, why? *A.*—We do not see any reason why there should be any difference in a locomotive running down hill, after the valve was balanced, as that does not alter its movement in any way. Any engine will run down hill better by having a relief-valve in the steam-chest.

(163) J. E. M., Oil City, Pa., asks: Will you please give me your method of arriving at the answer to the first question, 117, in your issue of March 22? *A.*—The question was: "If 100-horse power will propel a boat six miles an hour, what power will be required to propel it twelve miles an hour?" The answer was: "About 800-horse power," and was arrived at from the following considerations: The resistance of a boat to being moved through water is, about, as the square of the velocity. Hence, doubling the velocity will make the resistance four times as great, and as this resistance must be overcome in one-half the time, eight times the horse-power will be required.

(164) J. K. Columbus, O., asks: 1. How slow can I run a 3″x8″ engine, so as to get one-horse power? *A.*—You can probably get one-horse power at a speed of 200 revolutions. 2. How much heating surface should there be in an upright boiler to furnish steam for one-horse power? *A.*—For such an engine, not less than 15 square feet: 20 would be better.

(165) P. M. W., Circleville, O., asks: 1. Will you tell me the mode of japanning small articles of wood and iron, the temperature required, and length of time they are exposed to the heat; also, the composition of japan? *A.*—Wood, to be japanned, requires the greatest care in seasoning, and is usually dried for some time in an oven. Iron requires cleaning with turpentine, to remove all grease. After every coat of japan the article is subjected to heat in the oven, till quite dry, the only precaution required being not to heat it hot enough to injure the article, or to blister the varnish. The temperature may usually be from 200° to 300°. The work is kept in the oven till the varnish is thoroughly dry. Japan varnish is made in different ways. One way is to melt together 25 lbs. Naples asphaltum and 4 lbs. dark gum anime, and boil for about two hours in 6 gallons of linseed oil. Then melt 5 lbs dark gum amber, and boil slowly about the same length of time, and mix the two. After this, boil the whole for about two hours. It is better to buy the japan than to try and make it. 2. What is the difference between an injector and an inspirator? *A.*—An inspirator may be described as a kind of injector.

Business Specials

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Gears—G. B. Grant, 3 Alden st., Boston; water motors

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Metal & Wood Patterns—G. D. Lambert, N. Haven, Ct.

One set vertical engine castings 1⅜ H. P. Send for blue-print. A. H. Lefebore, Watertown, N. Y.

For first-class machine patterns and estimates, address John Valentine, 15 Alling st., Newark, N. J.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Fine tools and special machinery. Horace Thurston, 84 Clifford street, Providence, R. I.

National Chuck and Small Foot and Power Lathes. Lodge, Barker & Co., Cincinnati, O.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St., Washington, D. C.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 626 E st., Washington, D. C.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The "Wax Process" Engravings shown in the American Machinist each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

New Books, relating to steam, the steam engine, mechanics, machinery, and engineering. Send for catalogue. Fred. Keppy, publisher, Bridgeport, Conn.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham St., N. Y.

For copies of the American Machinist, dated January 22d, 188', clean and in good condition, we will pay 25 cents each. American Machinist Publishing Company, 96 Fulton street New York.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Bound Volumes of the American Machinist for 1880, 1881, 1882, and 1883, for sale at $3 50 per volume, express charges to be paid by purchaser. American Machinist Pub. Co., 96 Fulton Street, New York.

"Painting and Painters' Materials."

The best book for all who paint, deal in paint, or have painting done. $2 25. For sale by "The Railroad Gazette," 73 Broadway, New York.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Useful Information for Steam Users—A 100-page pamphlet, compiled from the best authorities, on the care and management of the steam engine and boiler, with hints and rules for engineers and firemen. Engineers everywhere should have this work. Send 25 cents in P. O. stamps for a copy. The J. N. Mills Publishing Co., 145 Broadway, N. Y.

Parties having machine tools for sale, please send lowest cash prices and particulars, for a 26-inch swing, 12 foot bed, back geared screw lathe; a 16 inch x 6 foot screw lathe, with back-gear; an upright drill, to swing 32 inches; also a planer 24 or 26 inches square x 6 or 7 foot table, to C. D. Force. P. O. Box 506 Fall River, Mass.

Manufactures.

Lynchburg, Va., is likely to have a new cotton mill.

The Shell Beach Railroad, of New Orleans, will build repair shop 200x50 feet.

The contract for building the Durham (N. H.) cotton mill has been awarded for $22,000.

The Seaton's Patent Wagon Company, capital $30,000, has been organized in Tullahoma, Tenn.

Subscriptions to the proposed $300,000 cotton mill, at Roanoke, Va., seem to have come to a stand-still.

Bids for the construction of the round-house and locomotive and car shops at Albani, Oregon, will soon be opened, and a contract for the same immediately thereafter awarded.

The machine shop of Fay & Scott Dexter, Me., has become too small for the business being done, and the firm is looking for inducements to locate in some other town in the State.

The stock of the cotton-seed oil mill, to be built at Fort Worth, Texas, has been increased to $50,000, six men taking the second $25,000. The ground and machinery have been purchased.

The single bell-chime whistle, Crosby pop safety valve, and Crosby gauges have been selected by General Hyde for the new yacht, now building by J. White & Co., for the Viceroy of India.

The Georgia Pacific Railroad will erect round house and repair shops at Anniston, Ala., and the Anniston and Atlantic Railroad is expected to erect machine shops at same place soon.—*Baltimore Manufacturers' Record.*

The H. A. Ramsey Company is a new corporation in Baltimore, which is building shops for iron-ship building, bridge work, and other iron work. When the shops are completed, several hundred hands will be employed.

W. R. Tuttle, B. R. Strong, M. McGhee, E. J. Sanford, S. Tuttle, and other citizens of Knoxville, Tenn., have organized a $125,000 stock company, to build a cotton mill. The site has been purchased and the building is soon to be erected.

Robert J. Stuart, late of Sedgwick & Stuart Manufacturing Company, Poughkeepsie, N. Y., has leased, with privilege of purchasing, Mullock's foundry and machine shop, at Middletown, N. Y. The lease includes tools, business, etc. He has enlarged the foundry, put in a new 8-ton cupola, and will employ about thirty hands. New tools are also being placed in the machine shop. The work at the outset will be mainly jobbing.

The Link-Belt Machinery Company, of Chicago, have issued a new illustrated catalogue and price-list of the Ewart detachable-link belting and machinery. The merits of link belting have been established beyond question, and the demand for it has greatly increased, so that the company during the last year have built new works, having 58,000 square feet of flooring, filled with tools and machinery for manufacturing. They also supply pulleys, shafting, gearing, and general mill machinery.

The property which the Helmbacher Forge and Rolling Mill Company have leased, at the corner of Lami and DeKalb streets, St. Louis, is 146x146 feet. On this they will erect a scrap house 54x146 feet, a machine shop 91x50 feet, and a stable 20x96 feet. The remaining space will be used for a yard. The machine shop will be provided with a full line of heavy machinery, and the scrap shop will contain powerful shears and improved appliances for handling scrap.—*Age of Steel.*

A new, copiously illustrated catalogue and price-list has just been issued by the Waterbury Farrel Foundry and Machine Company, of Waterbury, Conn. It shows new cuts of power, drop and foot presses, rivet machines, rolling mills, slitters, lathes, dies, punches, etc. In the preface, they say they have patterns for a great variety of special machinery, adapted to nearly all branches of hardware manufacture. They furnish plans and estimates for complete outfits of machinery, and give estimates of cost from special drawings or specifications.

About two years ago the Brown & Sharpe Manufacturing Company sent, on order, a set of epicycloidal gear cutters to H. P. Feister, superintendent of the Franklin Machine Works, Philadelphia, for cutting a train of very difficult gearing for use on a peculiar printing machine, invented by the latter. The purchaser now writes to that company that the machine is a great success, and the train of gears finished by those cutters run harmoniously at high speed, giving results "that could only have been obtained by the very best of gearing, cut by the very best of cutters."

Two injector patent cases were recently decided in the United States Court, at Detroit. That of James Jenks against the selling agent of the Hancock Inspirator Company, for infringement, was decided in favor of the defendant, on the ground that the reissued patent (on which infringement was claimed) was for another invention than the original. That of the Hancock Inspirator Company against James Jenks, for infringement by making and selling what the latter styles the "Duplex" injector, was also decided in favor of the company. Unless a rehearing is secured a "master" will be appointed to decide what damages the company is entitled to in the latter case.

The Lowry Wagon Factory, at Augusta, Ga., is to be enlarged, by the addition of a 50x170 feet building.

The Fish Brothers Manufacturing Company, of Racine, Wis., have been reported looking around for a new location for wagon works. A number of lumber towns are trying to get the manufactory.

A new illustrated catalogue and price-list of the machinery made by Watson & Stillman (successors to E. Lyon & Co.), 470 Grand street, New York, has been issued by that firm. It embraces hydraulic jacks and punches, hydraulic presses, lever and screw punches and shears, and polishing and buffing machinery.

The Ashcroft Manufacturing Company, New York, write us: We are pleased to say that our sales of valves are constantly increasing. We have just received from one large manufacturing concern an order for fifty of our 4″ nickel-seated safety valves, also an order from the William Cramp's Sons Ship and Engine Building Company for our special 5″ marine valves for ships they are building, and, from Messrs. Roach & Son, for the valves for the U. S. ship Dolphin. Have recently increased our working force in the shop to meet the increased demand for orders.

The Georgia Machinery Company, Atlanta, Ga., write us: Our business is increasing every day. We have just put in two lathes, one a 20′ bed and the other a 10′ bed, 20″ swing; also a planer and a pulley turning and boring machine, all of which we purchased from H. Prentiss & Co., your city. Our foundry is running nearly night and day, we having received large orders from the East Tennessee Railroad Company and other large corporations. Our wood-working department is kept very busy, and our sales of engines, saw-mills, and wood-working machinery are growing larger. We are manufacturing several machines of our own design, and will soon place a shingle machine on the market that will entirely supersede the old style of working.

Peoria, Ills., has a great reputation for whiskey. Its distilleries are both large and numerous. Strange as it may appear, Peoria has also an interest in water. Perhaps, however, the milder liquid is not used there freely as a beverage, but more as an element in the production of the ardent. The Mayor of Peoria has written a letter to the Dean Brothers Steam Pump Works, noting how well a pair of pumping engines, put in by that establishment in 1875, have worked. They work by direct pressure, there being no reservoir and have to keep running night and day to keep up the supply. They also furnish fire protection, working up to 180 lbs. pressure. In no instance have they failed, but have always worked economically, and after nine years' service are "in first-class condition."

The Bay Ridge Construction Company, of Brooklyn, N. Y., was formed some time ago, with $300,000 capital. The business is that of building or repairing any kind of steam or sailing vessels of iron or steel. They have secured a large water front at Bay Ridge, which is now being improved. Another company has been formed to operate in connection with them, called the National Marine Engine and Boiler Company. A. Perry Bliven, 83 Front street, New York, is chief constructing engineer. He says $400,000 stock of the Construction Company and $350,000 stock of Engine Company has been placed at par. The machine shops are to be erected by the Marine Engine Construction Company, at an expense of about $300,000. They will occupy four acres when completed, and will be fitted up with the latest machinery, made expressly for the company.

In a recent issue we mentioned a new shearing machine, being constructed by William B. Bement & Son, of Philadelphia, which was to have a screw 6 inches diameter and 40 feet long. Since then we learn that the shears for which the 40-foot screw is made are *wharf shears* of 100 tons capacity. The usual timber legs, however, are represented in this case by tubular iron spars, which will stand something over 100 feet high. The screw will give horizontal motion to a nut, near the ground level, carrying the lower end of a third iron spar or strut whose upper end is attached to the two legs at the top. This is for giving the swinging or carrying motion to the shears, in a direction at right angles to the water front. The structure is designed by the American Ship Building Company, and the firm is doing for them the heavier parts of the work, for which the company has not, as yet, facilities.

The Cleveland Twist Drill Company, Cleveland, O., send us a twist drill made by them, which, we judge, embodies some new features of construction. The drill is ground all over, after hardening, including the taper shank, and backing off, to provide for its running perfectly true in a true chuck; that is, the grinding corrects the inevitable spring due to tempering. Another feature in which this drill differs from the ordinary twist drill is, in having a flute of equal area from the point to the shank. The flute is cut on the "increase twist" principle, and the stock left at center gradually increases from the point to the shank, but instead of the area of the part cut away being correspondingly less, as the thickness at center increases, by their process of cutting the flutes, they are cut enough wider towards the shank to keep the area of part cut out equal, or apparently a little greater towards the shank. This is evidently for the purpose of affording a better chance for the chips to clear, by giving them as much room at the shank of the drill as at the point. We believe all the drills made by this company have this flute of equal area, but that the grinding all over, after hardening, is only done at special rates.

Machinist's Supplies and Iron.

New York, March 27, 1884.

The markets remain decidedly dull, although the improved weather has induced a hopeful outlook for business in the near future.

Iron, American pig—There has been little fresh business during the week, and consumers continue to follow the hand-to-mouth principle.

No. 1 X Foundry, $20.50 to $21. A few contracts have been made for this brand as low as $20. No. 2 X $19 to $20; Grey Forge $16.50 to $17 50.

Scotch pig—Coltness, $21.50, to arrive, and $22 to $22.50 from yard; Glengarnock, $21.50 to arrive, $22 yard; Gartsherrie, $21.50 to $22; Summerlee, $21.50 to arrive, $22 yard; Carnbro, $20 50; Eglinton, $20.50 to $21.

Copper—The market for ingot has been easier. Lake, 14⅝c. to 14¾c.

Lead—Common pig has ruled firm at 4.15c.

Tin—Market easy. Banca, 19½c.; Straits and Malacca, 18¾c.

✲WANTED✲

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Experienced mechanical draughtsman wants engagement. Address E, Box 8, Am. Machinist.

Wanted—Situation as flange-turner. Highest references. Address E. P., Box 13, Am. Machinist.

Wanted, at once—Two first-class, experienced, mechanical draughtsmen, on light machinery. Address, giving age, experience, and wages expected. Brown & Sharpe Manufacturing Company, Providence, R. I.

Wanted—Situation as foundry foreman. Large experience in all classes of work; mixing and melting of metals, core making, etc., management of men. Good references. Address "Graphite," Am. Machinist.

A young man, having two years' experience in making mechanical drawings for pattern-makers and machinists to work from, would like a position as mechanical draughtsman—city or country. Address D. S. H., Am. Machinist.

A young man, aged 26, practical steam-heating engineer, wants to form partnership with a young man of means, in growing Western city. Satisfactory references given and required. "Steam," care Am. Machinist,

Wanted—Situation by a young man who is a first-class hand on the Brown & Sharpe Universal Miller; also, a first-class tool-maker and general machinist. Four years' experience as foreman. Out of the city preferred. Address "Milling," care of Am. Mach.

Wanted—A good moulder, with a small amount of money, to operate on his own account or on shares with the owners. A new foundry being very nearly completed, and that can command a large trade. For full particulars, address Box 338, Dallas, Texas.

Wanted—Mechanical engineer, who can use indicator, take dimensions, and superintend erecting work. Also, a good draughtsman. Permanent situations to competent men. Address by letter, stating experience and salary expected, "Engineer," 1705 N. 21st street, Philadelphia.

Wanted—A position as foundry foreman, by a practical moulder, in iron or brass. Has charge of thirty men in engine and jobbing foundry. Will go anywhere South or West. Good reasons given for changing, and reference as to management, economical melting and industry. "Foundry Economy," care Am. Machinist.

Wanted—A man capable of superintending construction of portable and stationary engines and boilers. Must be a good draughtsman and capable of estimating on work; thoroughly competent, and of sober habits. To such a man, will give a permanent situation. Address, giving references, "Superintendent," care Am. Machinist.

Foot Lathe for Sale—For particulars, address C. G. H., Box 753, Waterbury, Conn.

For Sale—Machine shop, in N. Y., with tools for gear cutting and small work generally. Satisfactory reasons for selling. Address G. C, Am. Machinist

THE NEW SOMBART PATENT **Gas Engine**

Best motor for small powers ¼ to 1 *actual* horse power. Send for prices. Sombart Gas Engine Co. Hartford, Conn. New York Office, 215 Centre St.

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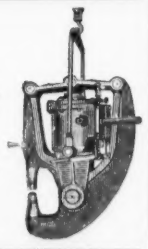

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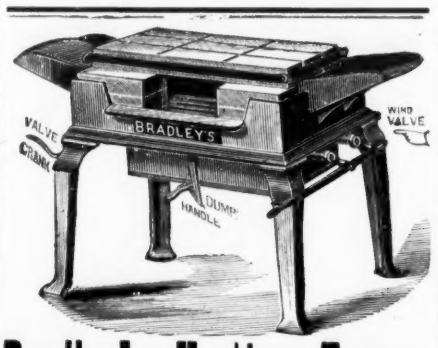

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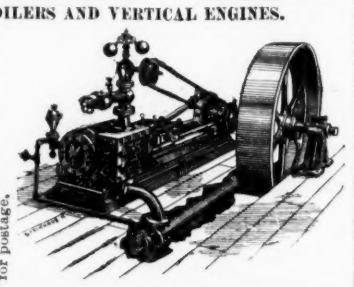

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1884.

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1884.

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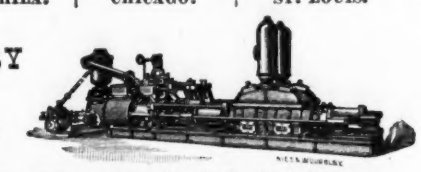

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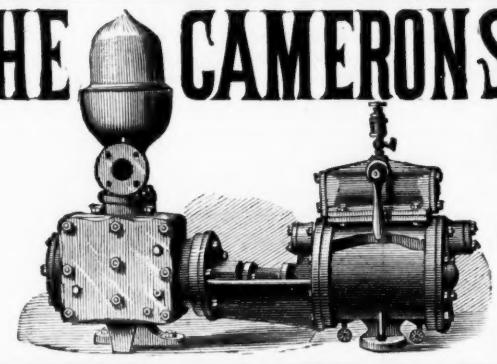

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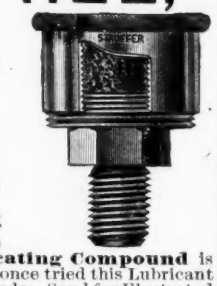

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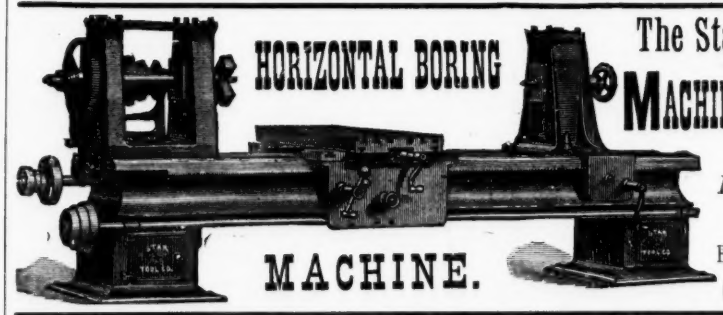

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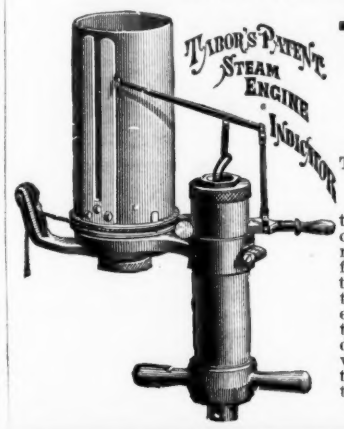

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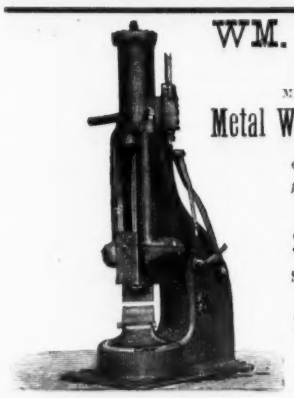

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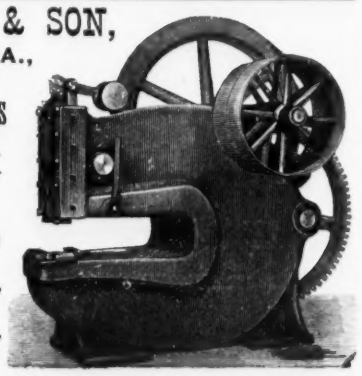

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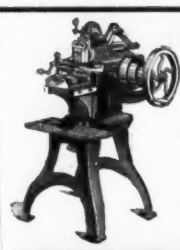

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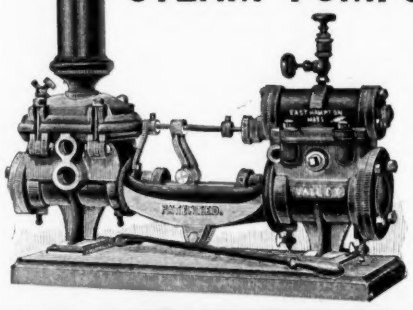

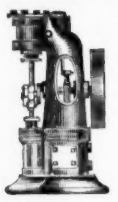

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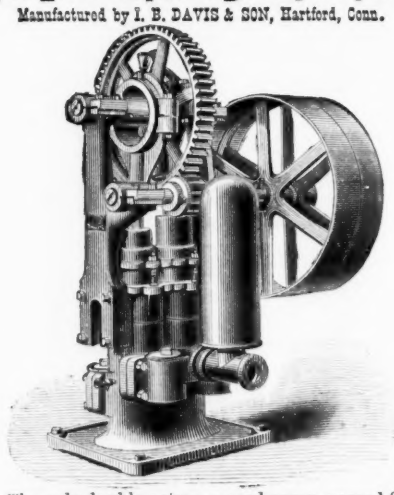

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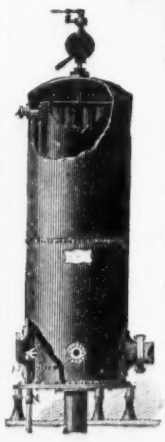

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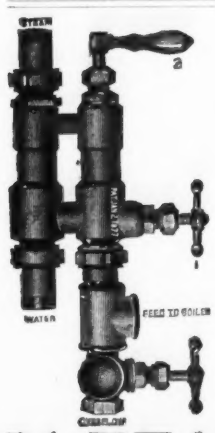

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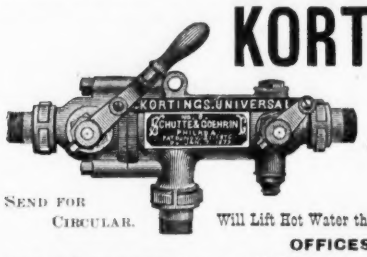

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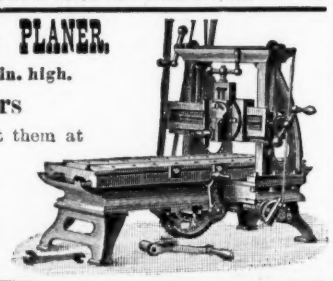

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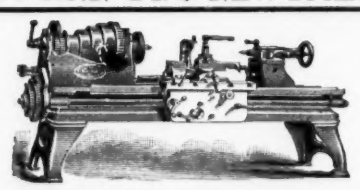

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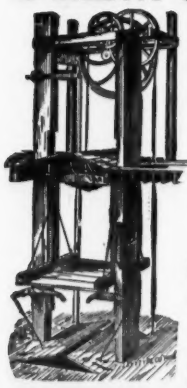

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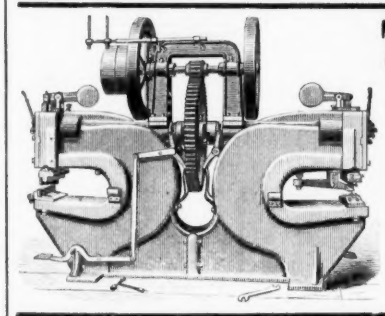

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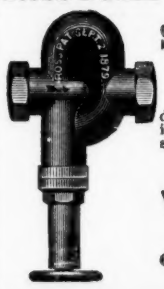

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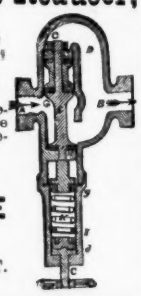

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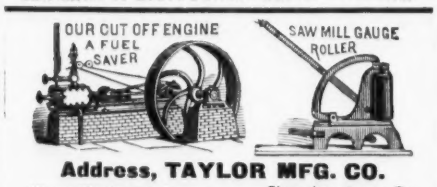

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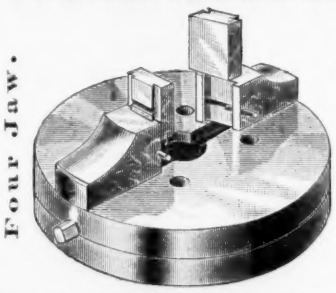

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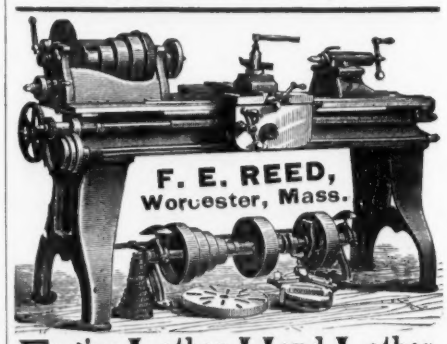

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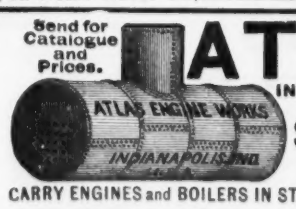

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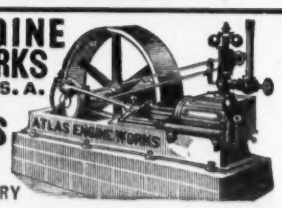

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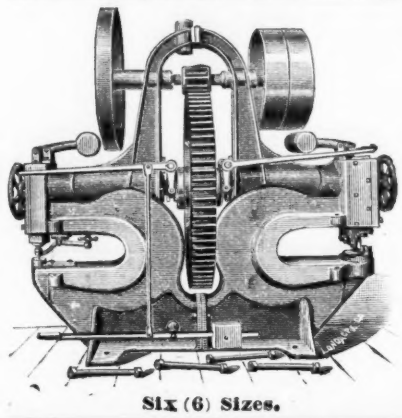

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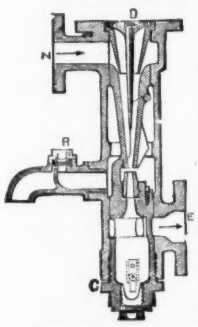

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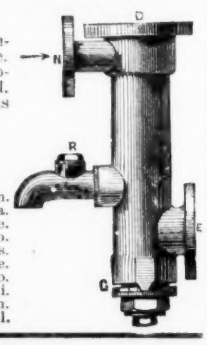

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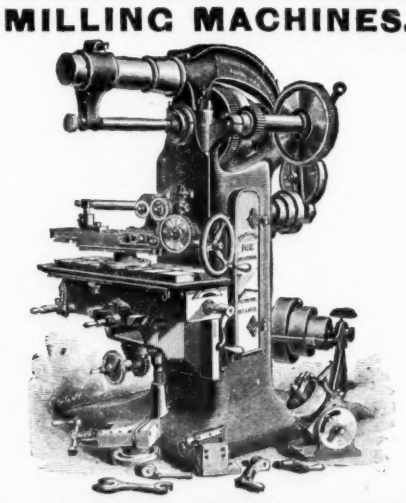

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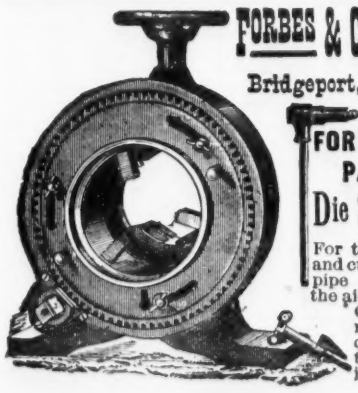

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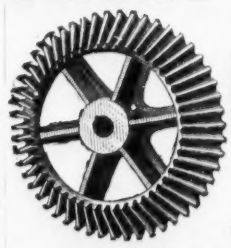

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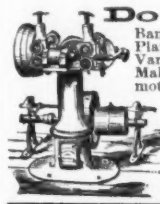

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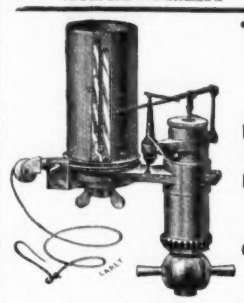

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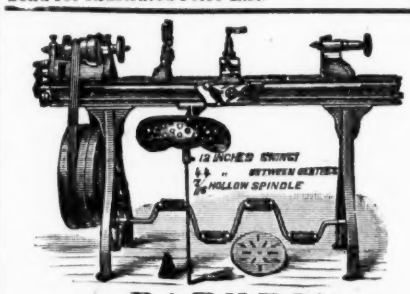

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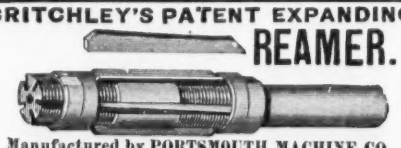

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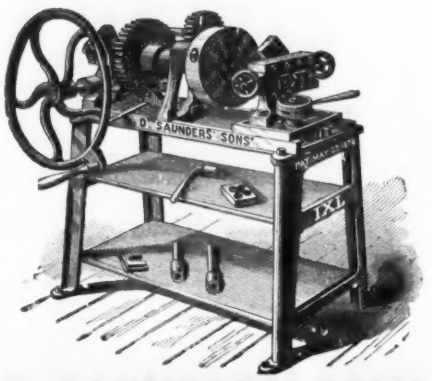

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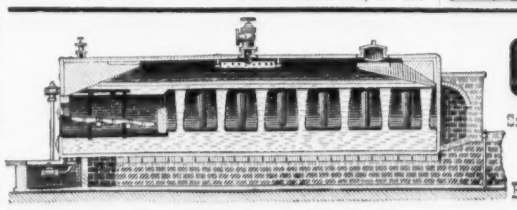

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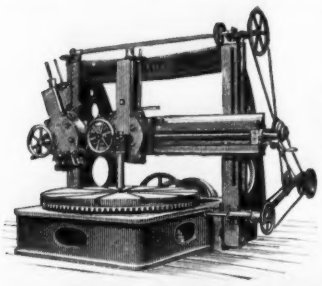

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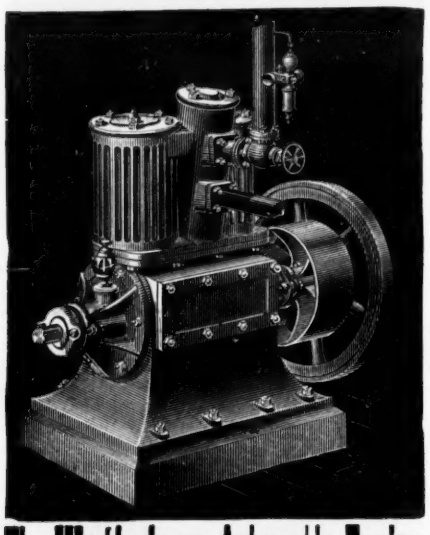

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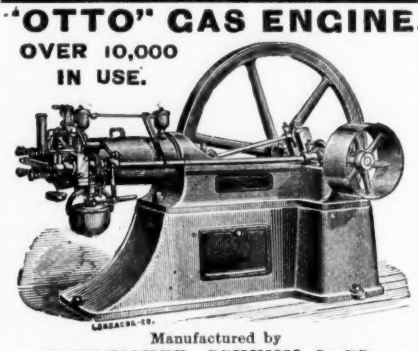

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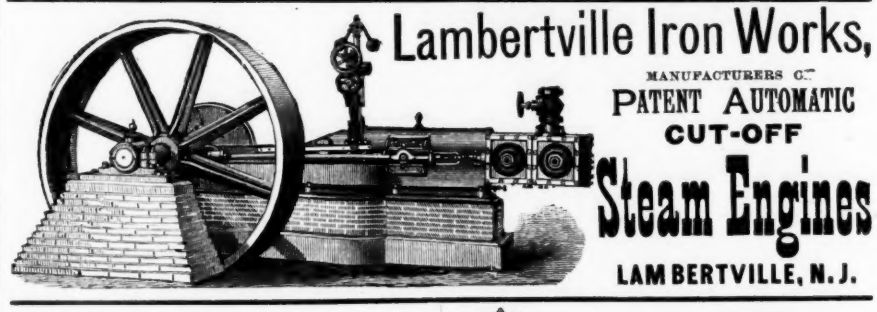

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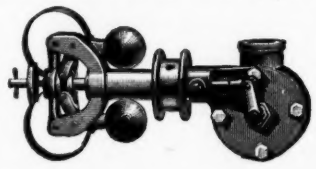

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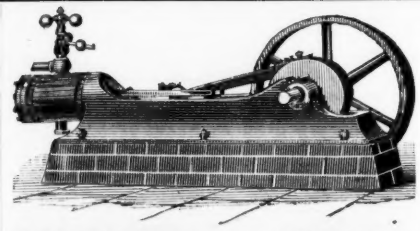

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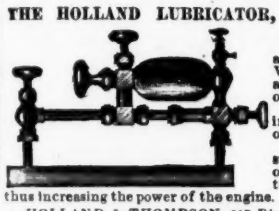

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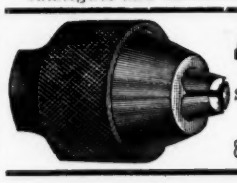

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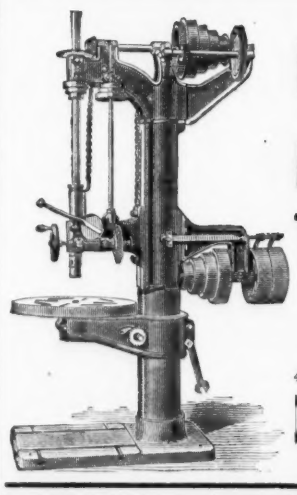

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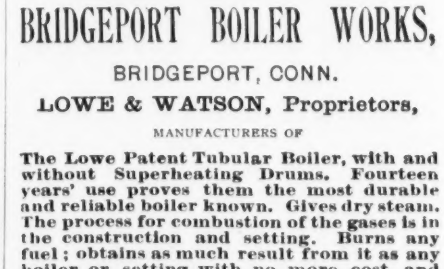

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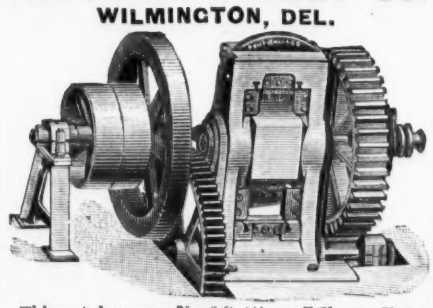

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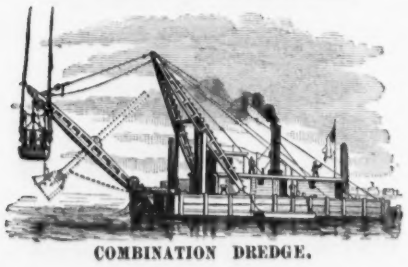

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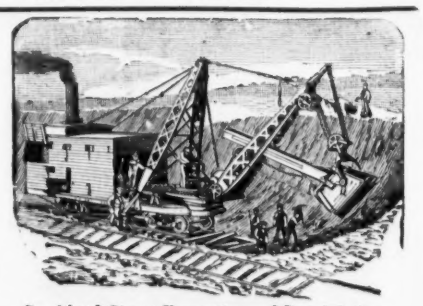

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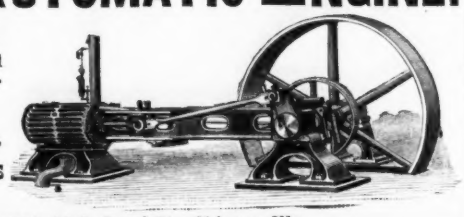

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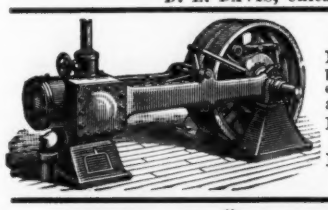

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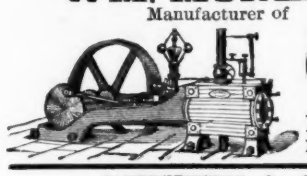

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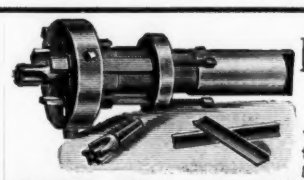

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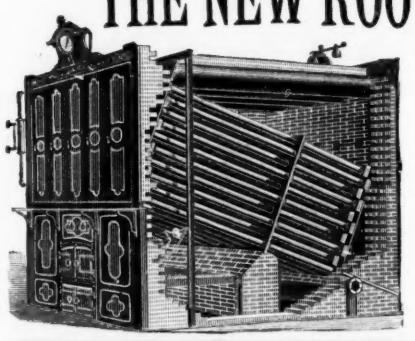

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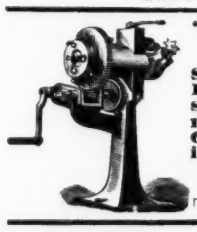

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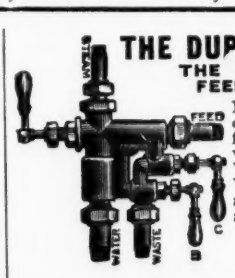

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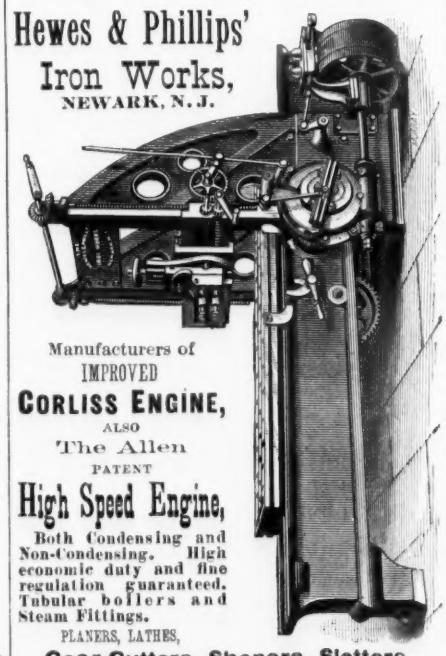

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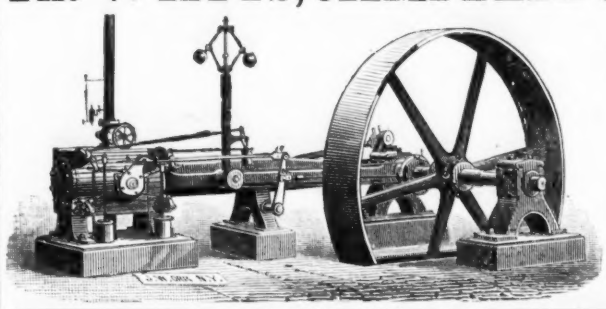

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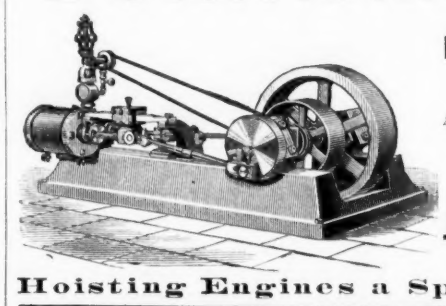

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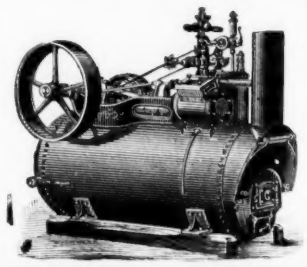

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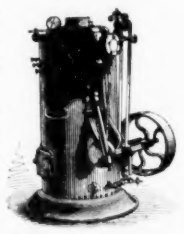

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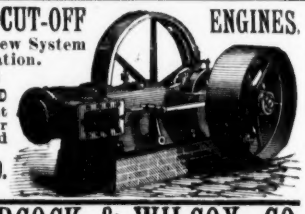

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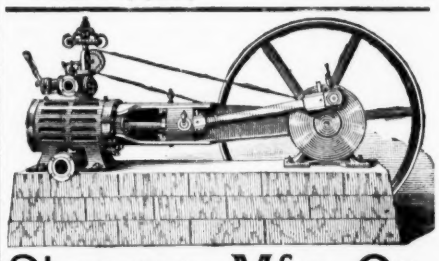

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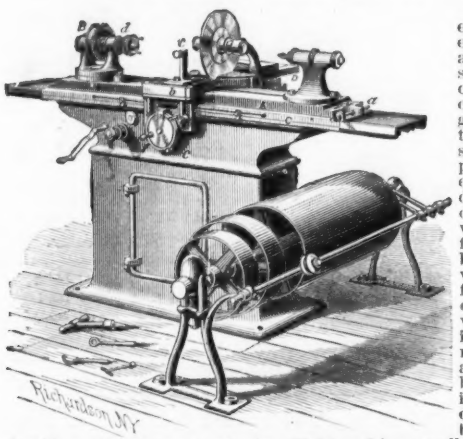

This Machine is arranged for doing a large variety of operations of grinding by the use of solid emery or corundum wheels. An additional movable table, capable of adjustment by a tangent screw and graduated arc, admits of straight and curved taper grinding with the centers of the machine always in line. It is specially adapted for grinding soft or hardened spindles, arbors, cutters, either straight or angular, reamers and standards, also for grinding out straight and taper holes, standard rings, hardened boxes, jewelers' rolls, &c. The work can be revolved upon dead centers or otherwise. The grinding wheel can be moved over the work at any angle, by which means any taper can be produced. Wheels from one quarter inch to 12 inches in diameter can be used either with or without water. The feed works and slides of the machine are covered and fully protected from grit and dust. The grinding of taper holes and angular cutters is provided for with graduated arcs. A special chuck for holding work to have holes ground, accompanies each machine. The spindle and boxes of the machine are of cast steel hardened and ground. Distance between centers, 28 inches; will swing 12 inches in diameter. The overhead works consist of a drum, tight and loose pulleys and adjustable hangers with self-oiling boxes. Countershaft should run 400 turns per minute. Tight and loose pulleys, 8 inches diameter, 4 inches face. Weight of machine, with overhead works, about 2300 lbs. Illustrated Catalogue sent per mail on application.

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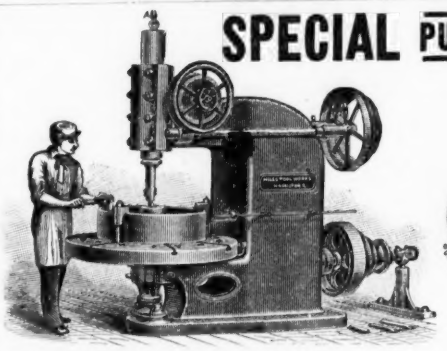

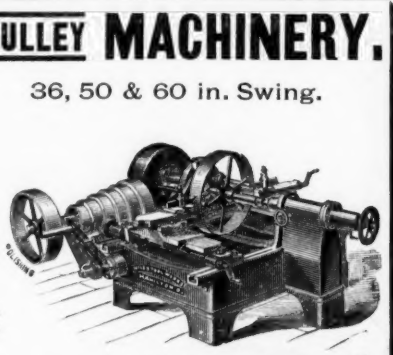

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Very truly yours, **W. McGREGOR & CO**

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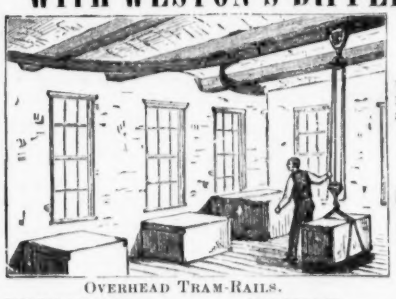
WITH WESTON'S DIFFERENTIAL PULLEY BLOCKS.



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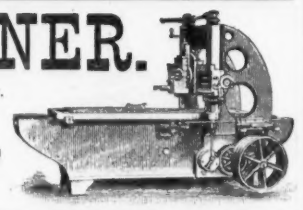

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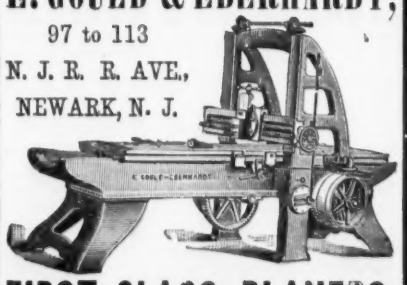

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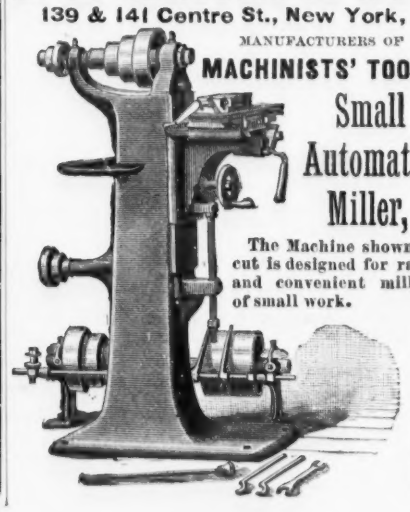

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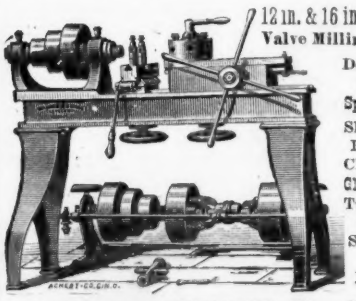

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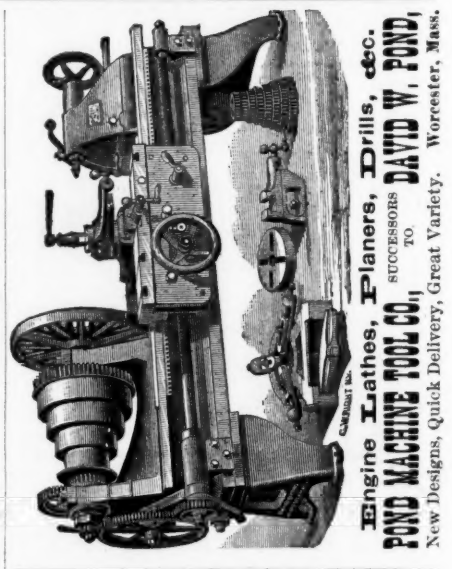

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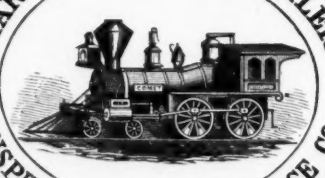

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